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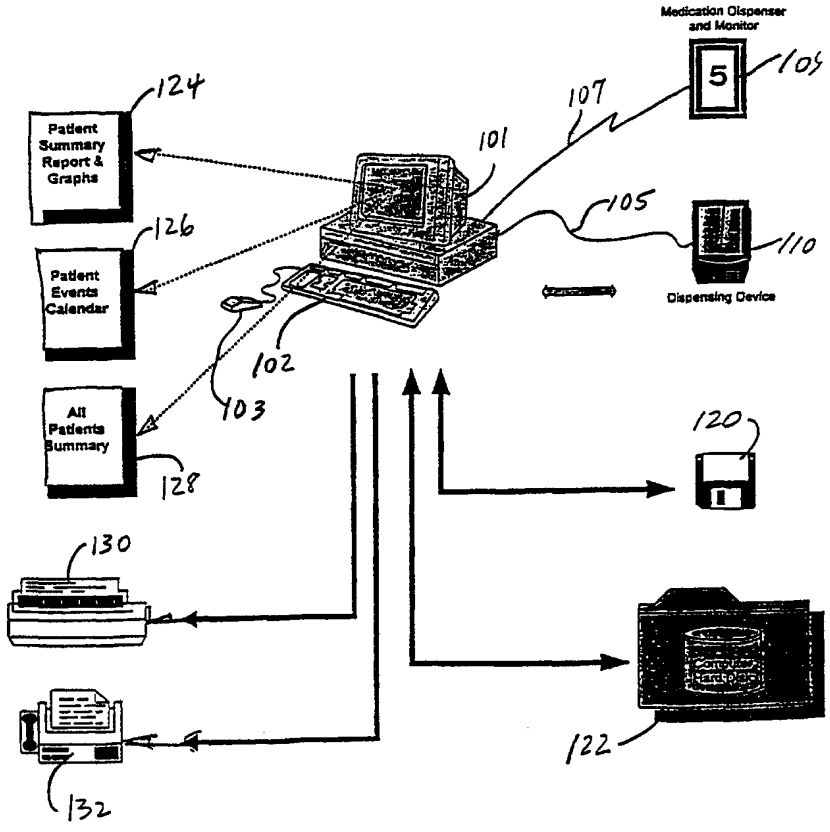
(54) **Title:** SYSTEM AND METHOD FOR MANAGING ADMINISTRATION OF MEDICINE

(57) **Abstract**

A method for managing doses of medication delivered to a patient is described. A computer system (101) receives dosage data and administration data that represent, respectively, times and quantities for taking a drug that are prescribed for a patient, and the times and quantities the drug is delivered to the patient. Based on the dosage and administration data, compliance information is generated and displayed, representing the degree to which a drug has been delivered in accordance with the dosage data. In one aspect, a calendar (126) in the form of a grid comprised of grid elements is displayed. Each grid element represents a period, such as a day in a month, and contains one or more icons. An icon's appearance indicates whether a particular dose was delivered properly, when a grid element is selected by a user, more detail is displayed about the administration of the drug for the respective day.



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SYSTEM AND METHOD FOR MANAGING ADMINISTRATION OF MEDICINE RELATED APPLICATIONS

SYSTEM AND METHOD FOR MANAGING ADMINISTRATION OF MEDICINE

RELATED APPLICATIONS

This application claims priority from prior U.S. provisional application serial number 60/071,107 filed on January 12, 1998, entitled "Method and System for Monitoring Doses," which is incorporated by reference in its entirety as if fully set forth herein.

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FIELD OF THE INVENTION

The present invention relates generally to computer systems. The invention relates more specifically to managing administration of medicine, monitoring dosages of drugs given to patients, and the like.

BACKGROUND OF THE INVENTION

Monitoring dosages of drugs or medicines for patients requires communication among several levels. First, a physician must diagnose and prescribe a dosage for a patient. The medication must then be distributed accurately and, finally, the patient or a care provider must ensure that the dosages are properly administered to or taken by the patient.

For many reasons, ensuring that accurate dosages are delivered to a patient in a consistently timely manner can be difficult despite the importance of accurate administration in many instances.

Therefore, it is desirable to provide a method of automating the delivery of medicine and monitoring the delivery of medicine.

Moreover, special challenges are presented in managing patients who are taking more than one medication. Elderly patients on multiple medications may have difficulty keeping track of whether they have taken all their medications, when, and in what quantity. In the clinical setting, proper administration of multiple medications to acutely ill patients is challenging for care providers.

Thus there is a need to track multiple medications and multiple dispensing mechanisms, and to present data for all such dispensers in a report.

To facilitate the proper administration of medication and the tracking of when it is administered, medication dispensing devices are used. Conventional medication dispensing devices typically include a medicine container and an alarm mechanism which notifies a patient at the time intervals the dose(s) are due. Each time the patient opens the container, the device records the event and the time it occurred. One example of a conventional medication dispensing device is a jar with lid which incorporates an alarm mechanism and a recording mechanism. When the lid is removed, the recording mechanism records this event and the time it occurred.

One drawback to conventional dispensing devices is that they do not control access to medicine or the quantities dispensed. Thus, there is little assurance that when a dispensing device is opened, the proper amount is dispensed. Another drawback is that once opened, the dispensing devices may be re-opened immediately. Thus a confused elderly patient, having forgotten the dose they just took, may take another far too soon.

Thus, there is further need for a system that controls dispensing times and amounts and which tracks those times and amounts.

SUMMARY OF THE INVENTION

The foregoing needs, and other needs and objects that will become apparent from the following discussion, are fulfilled by the present invention, which comprises, in one aspect, a method for managing doses of medication delivered to a patient. Generally, a computer system receives dosage data and administration data. The dosage data represents a drug prescription, and includes, but is not limited to, one or more times for taking the drug, the quantities in which the drug is to be taken by the patient, or a combination thereof. The administration data represents when and in what quantities each dose in a set of doses of the drug is actually delivered to the patient. Based on the dosage and administration data, compliance information is generated and displayed. Compliance information indicates the degree to which a drug has been delivered in accordance with the dosage data. The compliance information can be displayed in variety of forms.

According to another aspect, a calendar in the form of a grid comprised of grid elements is displayed. Each grid element represents a period, such as a day in a month, and contains one or more icons. An icon's appearance indicates whether a particular dose was delivered properly. For example, a green square icon indicates that a dose was delivered on time, and a triangular red icon indicates that a dose was not delivered. When a user selects a grid element, more detail is displayed about the delivery of the drug for the respective day. In particular, a graphical object is displayed that contains one or more icons for each dose delivered in the day. An icon's position along an axis of the graphical object reflects when a dose was delivered.

According to another aspect, data is generated that specifies what portion of a set of doses was delivered properly. The data includes values that indicate what portions of the doses were delivered, and what proportion of doses were delivered on time.

According to another aspect, dosage data is transmitted to a dosage-dispensing device. The dosage data includes times and quantities to deliver a drug to a patient. In addition, data representing a lockout period may be transmitted. The dosage-dispensing device dispenses the drug to the patient in accordance with the data transmitted to it.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings and in which like reference numerals refer to similar elements and in which:

FIG. 1 is a block diagram illustrating a system for monitoring patient dosages.

FIG. 2 is a flow chart illustrating steps for a computer-implemented method for monitoring patient dosages.

FIG. 3 is a flow chart showing steps for retrieving data that is used in a system for monitoring the administration of doses to a patient.

FIG. 4 is flow chart showing steps for transmitting dosage information to a dosage-dispensing device.

FIG. 5A is block diagram depicting a calendar in the form of a grid.

FIG. 5B is a block diagram depicting a grid element and icons used to indicate patient compliance.

FIG. 5C is a block diagram depicting a graphical object used to graphically represent when doses were delivered.

Fig. 6 is a block diagram depicting a histogram showing dosage scores over period of time.

DETAILED DESCRIPTION

OVERVIEW

One embodiment is a system and method for substantially automating the administration of patient dosages, the monitoring of the delivery of doses, whether or not timely and whether or not accurate in amount, and the accumulation of data for individual patients representing administration data over an extended period of time.

Another embodiment encompasses accumulation of data for each patient from a plurality of dosage dispensing devices, and the assimilation of such data into reports which may be either specific for the particular patient, or an accumulation of data for an entire range of patients. In this way, more accurate dispensing of doses is achieved, as well as more accurate monitoring to facilitate detection of whether prescribed doses are being properly administered to the patients.

A preferred embodiment provides a computer-implemented method for monitoring patient dosages by retrieving administration data, including times and amounts of medication prescribed for a patient, retrieving patient data, including times and amounts of medication delivered for the patient, determining evaluation data by analyzing the retrieved dosing and patient data to determine compliance of the delivered medication to the prescribed medication, and displaying the evaluation data.

The method may include one or more of the following features. Patient data, including administration data, may be received from an associated device over a communications line, from local memory, or from user input. The data may be accumulated to provide a basis for patient evaluation. The patient data may be transmitted to a dosage-dispensing device, which dispenses doses to the patient in accordance with the received patient data.

The evaluation data may be displayed in a variety of ways, including display in a patient administration report that may indicate compliance of the delivered doses to the prescribed dosages. In one implementation, the data retrieved may be viewed in a scrollable tabular grid, with displayed values for all medication events, and dates, times and dose sizes

dispensed from the dosage dispensing device. In addition, non-medication events may be displayed, including "bottle replaced" or other ancillary but relevant data.

Additionally, evaluation data may be displayed in the form of a patient summary report which may, for example, include all information for a particular patient including name, ID, monitoring dates, drug, brand, and so on. In addition, a histogram may be prepared summarizing the patient's compliance, including calculation of a "compliance index" or similar quantification of the patient's overall compliance with the prescribed dosing plan. The evaluation data may be displayed for varying periods, such as a week, a month, or a shorter or longer period, and may be displayed in graphical form including options for displaying doses delivered, missed, or delivered but not within compliance parameters. The data may also be displayed in calendar form.

In many instances, patients undergoing treatment may have multiple dosage dispensers. In a manner similar to the single dispenser arrangement discussed above, data for each such dispenser can be tracked and presented in a merged patient summary report. Likewise, a summary of all patients may be provided which may provide, in either graphical or tabular form, any of the selected data including name, ID, compliance index, dosage, time of day, or any other field. Histograms may also be developed across the patient class.

Evaluation data may be provided in any suitable format, such as a data file or hard copy. For example, the data may be printed or transmitted to a remote facsimile machine.

According to one embodiment, the delivery of doses of multiple patients is monitored. In this embodiment, a preferred method comprises retrieving dosage data, including times and amounts of medication prescribed for a plurality of patients, retrieving patient data, including times and amounts of medication delivered for the plurality of patients, determining evaluation data by analyzing the retrieved dosing and patient data for the plurality of patients to determine overall compliance of the delivered medication to the prescribed medications, and displaying the evaluation data.

Another embodiment includes a memory device storing computer readable instructions for aiding a computer to implement a method for monitoring patient dosages such as that described above.

Yet another embodiment provides a system for monitoring patient dosages including a computer implementing a method such as that described above.

MEDICINE ADMINISTRATION MANAGEMENT SYSTEM

Embodiments of the invention may be implemented on special purpose electronic or data processing hardware, software applications running on general purpose hardware, or a combination of both. For example, an embodiment may be implemented in a dose administration system that includes a computer system running one or more application programs that provide functions for manipulating dosing and patient data, having access through appropriate communications links to remote devices.

FIG. 1 shows an illustrative system incorporating the present invention, including personal computer 101 running application software. Computer 101 has access to both dosage

data and patient data. For example, as shown in FIG. 1, the computer 101 includes a communications link 105 that couples computer 101 to dosage dispensing device 110. The dosage dispensing device 110 may be, for example, the portable medication administration device described in U.S. Patent Application Serial No. 08/ 867,010 entitled Liquid Medication Dispenser Apparatus, filed on June 2, 1997 and naming as inventors Debra L. McEnroe, Robert A. Britts, Phillippe Pouletty and Ralph Levy, the entire contents of which are hereby incorporated by reference as if fully set forth herein. Dosage dispensing device 110 may be used to dispense, for example, an analgesic drug, opiate agonist or antagonist drug, or a immunosuppressive drug, such azathioprine, Tacrolimus, Sirolimus, mycophenolate, mofetil, and their chemical derivatives,.

A portable medication administration device is a device which may be transported with the patient outside a medical facility such as a hospital or doctor's office, and which delivers multiple doses to the patient without immediate supervision by a registered medical clinician. Such dispensers are typically used by, for example, physicians and pharmacists, to input dosage data.

Communications link 105 enables the dosage data to be recorded at locations remote from the monitoring system, such as at medical facilities where medications are prescribed.

In the illustrated monitoring system, the computer 101 retrieves information relating to the patient data from data stored on diskette 120 or in a mass storage device, such as the computer's hard disk drive 122. This data typically includes a record of doses delivered to the patient and is typically created by the patient or a caretaker. As with the dosage information, this information may be input at remote locations, such as at a patient's home or a location where the medication is administered.

Of course, dosage and patient data may also be provided by alternative methods. For example, the data may be input directly by a user through the computer keyboard 102. The computer 101 can save input and retrieve information by downloading to the diskette 120 or hard drive 122, or if appropriate, may initiate to medication dispenser and monitor 109 a communications link 107. Communications link 107 may use electrical, electromagnetic, optical signals, or other signals that may carry digital data. These signals are exemplary forms of carrier waves transporting information.

Application software running on the computer 101 processes the dosage and patient data to determine monitoring information for patients. The monitoring information is provided to a user in the format of, for example, patient summary reports and graphs 124, event calendars 126, and summaries of groups of patients 128. The monitoring information can also be provided in hard copy via printer 130 or fax 132 through appropriate communication links.

Computer 110 may transmit data to dosage dispensing device 110 via communications link 105. The data may include times and quantities to administer a drug to a patient, and a value representing a lockout period. Dosage dispensing device 110 delivers a drug in accordance with the received data.

In one embodiment, computer 101 is a personal computer having an Intel or AMD-type processor and running the Microsoft® Windows 95 or Windows NT operating system, and equipped with volatile memory such as RAM and non-volatile memory such as a hard disk. A display device such as a CRT also forms part of computer 101.

MONITORING ADMINISTRATION OF MEDICINE TO A PATIENT

FIG. 2 is a diagram of a method of monitoring the administration of medicine to a patient. In one embodiment, the method of FIG. 2 is implemented in one or more application programs that are executed by computer 101.

At block 202, a computer such as personal computer 101 of the system of FIG. 1, begins execution of the application software. As shown in block 210, computer 101 retrieves dosage and patient data for a patient from stored data. As indicated by block 212, the steps of block 210 may involve retrieving previously stored data files from a mass storage device such as disk drive 122.

Alternatively, computer 101 may establish an appropriate communications link, such as a modem or ISDN line, to retrieve data from a remote device, such as the portable medication administration device illustrated in FIG. 1 and described in the above-referenced U.S. Patent Application Serial No. 867,010, filed June 2, 1997 and entitled Liquid Medication Dispenser Apparatus, previously incorporated by reference. In this alternative case, as indicated in block 214, the dispensing device 110 is connected to the computer 101 and prepared for communication with the computer.

At block 220, dosage and medicine administration information for a patient is reviewed. Specifically, updated patient data is processed by the application software and displayed as requested by a user. The application software may be adapted to manipulate the dosage and patient information as needed. For example, the software may monitor the dosages delivered to patients by recording times and amounts of doses taken by a specified patient, as indicated by the retrieved patent data. With access also to the dosage information for that patient, the software may determine, for example, compliance of a patient's delivered doses with the prescribed doses, either for specified dose times or over a period of time.

Block 220 may involve generating one or more reports, as shown by block 224. For example, the method may be used to generate calendars showing the dosing events indicating, for example, the times of prescribed doses for specific patients and whether the patient complied with those doses. The method may also generate summary reports and graphs reflecting the progress of treatment for specific patients, incorporating, for example, test results. Additionally, the method may generate summary reports for groups of patients, such as groups of patients taking the same medication or groups of patients of a specific physician.

The analyzed results may be stored and may be provided to a user. For example, the method may display the results on a computer monitor. Alternatively, as indicated in block 222, the computer 101 may provide hard copies of reports by printing to a printer or transmitting the results to a remote facsimile machine.

Optionally, as shown by block 230, the data is saved after it is reviewed. As indicated by block 232, the data is saved to the mass storage device from which it was retrieved. Alternatively, as indicated in block 234, computer 101 may clear the memory of an external device from which the data was received and save a new copy of the data, or modify appropriate parameters of the external device. A pre-defined format is used. For example, data read from the device 110 may be saved as one or more comma-delimited ASCII files on disk 122. Use of such a format enables the data to be human-readable, and allows the data to be imported into commercial, off-the-shelf application programs such as spreadsheets or word processors.

In one embodiment, the data is saved with a validation code that is computed at the time the file is saved. Whenever a saved data file is reopened, the code will be used to test and guarantee the validity of the data against corruption of the data or intentional modification by any means outside of the program. In a preferred embodiment, a relational database system such as the Microsoft Access Jet Engine is used for storing and retrieving all data.

At block 240, the operational sequence is complete.

RETREIVING PATIENT DATA - INCLUDING DOSES AND TIME DELIVERED

FIG. 3 illustrates an embodiment of a method of retrieving data. FIG. 3 illlustrates substeps involved in block 210 of FIG. 2 in greater detail.

At block 304, the computer system receives a request to read device data. For example, block 304 may involve receiving a request to read "current patient data" that is stored in the dispensing device 110. The request may be generated in response to, for example, a user selecting a program menu option in a graphical user interface ("GUI").

As shown by block 320, the system determines whether dosage or patient data for the requested patient already exists and has not been saved since a prior retrieval operation. If patient data for the requested patient already exists in memory and has not been saved during a prior retrieval, then in block 324, the system displays a prompt message to the user. The prompt message enables the user to select (1) canceling the request to retrieve patient data from the device, or (2) saving the prior data before continuing with the process of retrieving current patient data from the dosage-dispensing device. If the user chooses to cancel the request to retrieve the current patient data, then execution ends. If the user chooses to save the already existing data, then control flows to block 328, where the data is saved in a user specified file. Block 328 may involve displaying a dialog box or prompt to the user that requests the user to enter a file name or pathname. Control then flows to block 330.

At block 330, the current patient data is retrieved from the dosage-dispensing device and stored in a temporary buffer. The temporary buffer may be, for example, a temporary disk file or a buffer area in memory. At block 334, the data is checked to determine whether any transmission or data errors occurred during transmission from the dosage-dispensing device. For example, an 8-bit checksum algorithm can be applied to data received from a dispensing device 110 to detect errors. Such checksums are conventionally included by the dispensing device 110 in data that it transmits to computer 101. If any errors are detected, then at block

338, a message to the user is displayed, informing the user that errors exist in the data, and execution ends. If no transmission errors are detected, then control flows to block 340.

As indicated by block 340, the disk or other storage device is checked to determine whether any prior patient data for the patient has been retrieved and stored. If previous data has been retrieved from the device, then control flows to block 344. In this case, as shown by block 344, data for the patient is updated by merging the current patient data with the prior data. The merged data is stored in memory. A message is displayed informing the user that the merge has occurred.

As shown by block 348, the current data is stored. Alternatively, the merged data is stored, if merged data was created at block 344. The user interface is updated to reflect the addition of current patient data.

At block 360, a device retrieval dialogue is displayed, which is data about the just retrieved patient data. Such data can include patient name, the drug(s), prescribed doses per day, and the administration times.

TRANSMITTING DOSAGE DATA TO DOSAGE DISPENSING DEVICE

In one embodiment, computer 101 transmits dosage data to dosage dispensing device 110. The dosage data is used by dosage dispensing device 110 to control the dispensing of medicine. The dosage data may represent medicine to deliver, administration times, quantities, and a lockout period. A lockout period is a period of time that must elapse after dispensing a dose before another dose may be administered or delivered to the patient. The dosage data may specify medicines that include, for example, an analgesic drug, opiate agonist or antagonist drug, or a immunosuppressive drug. An example of a dosage dispensing device that receives data specifying administration times and quantities and a lock out period, and then which operates in accordance to such data, is the portable medication administration device, described in U.S. Patent Application Serial No. 867,010, filed June 2, 1997 and entitled Liquid Medication Dispenser Apparatus, previously incorporated by reference.

The ability to transmit data to a dosage device that dispenses medicine accordingly provides significant advantages. The amounts of medicine that are actually dispensed to the patient may be controlled, and premature administration of doses may be prevented.

FIG. 4 is a diagram of a method of collecting dosage data from a user, such as a physician or other clinician, and transmitting the dosage data to a dosage dispensing device.

As shown by block 410, a request is received from a user to enter dosage data. The request may be generated in response to a user selecting a program menu option in a GUI. As indicated by block 420, current dosage data for the patient is retrieved from stored data. At block 430, a data entry screen or dialog box is displayed, showing the current dosage data as the default data.

As indicated by block 440, dosage data is received from the user. The dosage data includes prescribed administration times and quantities and a lockout period. For example, the user enters the following information:

Number of Doses

Quantity and Unit

Times for Each Dose

Lock-out Period

As shown by block 450, the dosage data is transmitted to a dosage dispensing device, such as device 110 shown in FIG. 1. At block 460, the dosage data is stored in a mass storage device of a computer system, for example, hard disk 122 of computer 101.

In an embodiment of the present invention, the application software may be adapted to analyze additional data. This may include device monitoring data, such as the time a drug bottle was changed, temperature monitoring data, battery status, times data was downloaded from a dosage dispensing device, data identifying the bottle of the drug, such as data read from a bar code. Patient data may include test results measured at specified times to measure the effect of the administered dosages, or information on multiple drugs dispensed by a dosage dispensing device. Dosage data may include proper dosages of specified medications, as well as an indication of possible side effects and information regarding whether the dosage should be altered should those side effects be detected. In such a case, the application software may be adapted to provide an analysis of the effectiveness of the administered dosage.

EXEMPLARY GENERATION OF COMPLIANCE INFORMATION

To help determine whether a patient is administering a drug properly, compliance information is generated and displayed to a user. The system may display such compliance information in many forms. For example, the system may display a calendar that indicates whether particular doses were delivered properly. As another example, the system may display one or more compliance indexes, such as the percent of daily doses delivered or the percent of doses delivered on time. The compliance information may be generated by, for example, a computer system executing a computer program according to the source code set forth in the Appendix.

CALENDAR SHOWING PATIENT COMPLIANCE

FIG. 5A is a block diagram depicting a calendar 500. In the preferred embodiment, one or more calendars 500 are displayed to graphically convey user compliance information on a computer display, or other output device such as a printer.

Calendar 500 of FIG. 5A comprises a grid 502, which includes one or more grid elements 520. Each grid element 520 represents a particular day of the month, and may contain one or more icons 521 for each dose due on the particular day. The calendar 500 may also include a legend 523 that identifies each icon 521 with a descriptive label. Thus, each calendar 500 provides a snapshot display to the user of the dosages due for a particular patient throughout a particular month.

FIG. 5B shows grid element 520 in greater detail. Grid element 520 of FIG. 5B pertains to the second day of a particular month, as indicated by the numeric day value 540. Grid element 520 includes one or more icons 521 selected from among a new dosage icon 522, wrong time icon 524, on-time icon 526, and missed dose icon 528. The particular icons

521 that appear in a particular grid element 520 depend upon the content of the data previously entered for the patient by the user.

New dosage icon 522 is displayed so that it reflects the day the dosage was changed, as specified by, for example, dosing data retrieved from a dosage dispensing device 110. The new dose size may be displayed within new dosage icon 522. For example, new dosage icon 522 may include text showing that the dosage is "250 mg".

Preferably, wrong time icon 524, and missed dose icon 528 each are displayed with different patterns that indicate whether a dose was delivered properly. For example, wrong time icon 524 is a square shaped icon that is displayed in a first color, such as brown or tan, and is displayed for a dose that was delivered at the wrong time. A dose is delivered at the wrong time if it was delivered to the patient at a time outside the scheduled administration time.

Similarly, on-time icon 526 may be a green colored icon, and is displayed for a dose that was delivered on time. A dose is delivered on time if it was delivered to the patient within the scheduled administration time.

Missed dose icon 528 is a circular icon displayed, for example, in red, and has a thick border. The missed dose icon 528 indicates that a patient failed to take a scheduled dose.

The colors and shapes of the icons 521 disclosed herein are not required and are not important. What is important is that a wrong time dose, on time dose, and missed dose each are represented by a unique icon or symbol. In addition, another row of icons can be displayed in each grid element to indicate the number of doses due, each icon representing a scheduled dose for a day.

In one embodiment, each of the grid elements in grid 520 are graphical user controls. A user may cause the computer to display more information about a particular day reflected in grid 502 by manipulating the day's respective grid element. For example, a user, using mouse 103 as an input device, moves a mouse cursor of calendar 500 onto the day's respective grid element and then clicks the mouse. In response, computer 101 displays a graphical time line with icons positioned to reflect when the drug was delivered.

FIG. 5C depicts an exemplary graphical time line. Time line 550 is a graphical image having a horizontal length that reflects one 24-hour day. One or more icons 562 each represent a dose delivered for a particular day. Each of the icons 562 are displayed along the horizontal axis 564 of time line 550 so that their respective positions along the horizontal axis of time line 550 reflects when they were delivered. One or more hour labels 566 indicate the time at which a dose was delivered. For example, icon 562 represents a dose that was delivered at approximately 8:00 a.m., as indicated by hour label 568.

In one embodiment, icons 562 may include icons for missed doses. Such icons may be displayed using a different pattern than those used to represent doses delivered on time. In addition, icons representing doses delivered at the wrong time can be displayed using a third pattern.

COMPLIANCE INDEXES

Compliance information can also be provided in the form of compliance indexes. A compliance index is a set of one or more values that reflects the degree to which the actual delivery of a drug complies with the prescribed administration. A variety of compliance indexes may used.

For example, the compliance indexes may include a dosage-on-time index. The dosage-on-time index reflects the percent of doses that were delivered to the patient on time in a given period. For example, assume that a drug is prescribed to be administered three times a day, at 7:00 a.m., 3:00 p.m., and 11:00 p.m., plus or minus an hour. If for a given day the drug is in fact delivered twice at 8:00 a.m. and 6:00 p.m., then the dosage-on-time index for the day is thirty-three percent (33%).

A dose-per-day index reflects the percentage of prescribed doses that were at least delivered in a given period. In the previous example, the dose-per-index would be sixty-six percent (66%) because two out of three doses were delivered in the day.

A unit-per-day-index reflects what portion of the amount of a drug prescribed for a day was delivered to the patient. For example, 2000 mg may be prescribed, but 2200 mg may be delivered to the patient. Thus, the unit-per-day-index would be 110%.

The user may specify the period covered by a compliance index in a variety of ways. For example, a graphical user control list box may provide selectable list box items which each represent a period for which to generate a compliance index. One list box item specifies the last week, another the last two weeks, and another the previous month. In addition, the graphical user control text boxes can be configured to accept the beginning and end dates of a period.

Also, various techniques may be used to display compliance indexes to the user. Each index can be displayed as a numeral, or a graphic, such as a horizontal bar. The length of the bar would represent 100 percent, and a position of an indicator along the length would indicate a percent.

One or more compliance indexes may be presented in the form of a weekly dosing graph, as shown in FIG. 5C, or in other graph forms, such as a line, area, and histogram graph. In addition, a GUI may present a graphical user control through which a user may select the form of the graph for displaying compliance indexes. For example, a GUI may display a graphical user control list box containing list box items for each graph form. By selecting one of the list box items, a user specifies a graph form for displaying a compliance index.

Fig. 6 shows a score histogram graph according to an embodiment of the present invention. Score histogram graph 600 displays patient dosing scores in the form of a graph of "Time Span" versus "Score." The time span is selectable for a time range specified by the user. The score value represents a compliance index over, for example, the last 7, 14, 21, or 28 days, or a time span specified by the user.

Score histogram graph 600 contains one or more graphical bars, such as graphical bar 610. Each graphical bar is used to reflect a dosage score for a time period within the time span,

such as a day. To measure the graphical bars, score histogram graph 600 includes graphical score scale 604. The height of the graphical bars together with graphical score scale 604 indicate a dosage score for a particular time period. Graphical bar 610 reflects a score of 66%.

OTHER REPORTS

Other reports can be generated based on the foregoing information.

In particular, a Patient Dosing Report is generated based on data retrieved from the dispenser device 110. The data is displayed in a scrollable tabular grid. Displayed values include all medication events, dates, times, and dose sizes that are retrieved from the dispenser. Other non-medication events that are reported from the dispenser device to the computer 101 can be displayed at the option of the user. For example, when a user replaces a bottle in the dispenser, the dispenser device 110 reports a "bottle replaced" event to the computer 101. Such events can appear in the Patient Dosing Report.

As another example, a Patient Summary Report is generated. The report includes a header containing complete patient information such as Name, ID, Monitoring Dates, Drug, Brand, etc.

A Patient Summary Report, based on the merged data created in block 344 of FIG. 3, can be generated. The report summarizes data downloaded from multiple devices for the same patient.

A Summary of All Patients report presents a summary of all patients in grid form. The grid includes Name, ID, and Score for each patient. The grid may be sorted by any column. The Score value may be selected based on Doses Per Day or Time Of Day.

Preferably, the system provides a Print Preview function whereby the user can view any pages on the screen before they are printed.

PROGRAM STRUCTURE

Embodiments of the methods described further below may be implemented, for example, in one or more computer programs developed using Microsoft Visual Basic®. Preferably, the programs provide a multi-document interface whereby a user may view multiple documents simultaneously within the program. For example, the calendar dialog and medication event data dialogs described herein may be viewed at the same time.

In one embodiment, the program functions and method steps described above are organized in an application program using one or more pull-down menus, each of which has one or more menu options. Table 1 presents a hierarchy of menu options in one embodiment of such a program.

TABLE 1 -- MENU OPTIONS

FILE

- New
- Open
- Save ...
- Save As ...
- Print Setup ...

Print Preview ...
Print ...
Exit ...
DEVICE
Retrieve Dispenser Data
Program Dispenser
VIEW
Dosing Data
Dosing Calendar
Reports & Graphs ...
HELP
About

The application program may also provide confirmation dialogs that prompt the user to verify various functions, such as dosing, as they are performed and where appropriate.

In the foregoing specification, the invention has been described with reference to specific embodiments thereof. It will, however, be evident that various modifications and changes may be made thereto without departing from the broader spirit and scope of the invention. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

APPENDIX

CycloTech Medication Monitoring Program

SangStat Medical Corporation

Produced by Glen Hamilton, Cyber Innovations Corporation

Code Listing From
3/19/98

Table Of Contents

1

```
Attribute VB_Name = "modGeneral"
Option Explicit

'Declare DLL calls
Declare Function OSWinHelp% Lib "user32" Alias "WinHelpA" (ByVal hWnd&, ByVal HelpFile$, ByVal wCommand%, dwData As Any)
Declare Function GetPrivateProfileInt Lib "kernel32" Alias "GetPrivateProfileIntA" (ByVal lpApplicationName As String, ByVal lpKeyName As
➥ String, ByVal nDefault As Long, ByVal lpFileName As String) As Long
Declare Function GetPrivateProfileString Lib "kernel32" Alias "GetPrivateProfileStringA" (ByVal lpApplicationName As String, ByVal
➥ lpKeyName As Any, ByVal lpDefault As String, ByVal lpReturnedString As String, ByVal nSize As Long, ByVal lpFileName As String) As
➥ Long
Declare Function WritePrivateProfileString Lib "kernel32" Alias "WritePrivateProfileStringA" (ByVal lpApplicationName As String, ByVal
➥ lpKeyName As Any, ByVal lpString As Any, ByVal lpFileName As String) As Long

'Set up some temporary buffers for getting strings from DLL calls
Public Const giBufSize1024 = 1024          'set size of input buffer for strings
Public gsTempBuf As String                 'input buffer for strings (defined at program start)

Public giLatestOptionsTabSelected As Integer    'keep track of the tab that was last selected by user (goes back to it next time it is
➥ opened)
Public gsLastStartDateChosen As String          'a starting plot date last selected by user
Public gsLastEndDateChosen As String            'an ending plot date last selected by user
Public gsLastDateSet As String             'a temp string used to pass dates back and forthe to the calendar
Public gsDateDisplayFormat As String       'holds the user's choice for the displayed date format for dialogs and reports
Public gsTimeDisplayFormat As String       'holds the user's choice for the displayed time format for dialogs and reports
Public gsCustomLblPatientLastName As String     'replacement labels for the dialogs if exist in config file.
Public gsCustomLblPatientFirstName As String    'replacement labels for the dialogs if exist in config file.
Public gsCustomLblPatientID As String
Public gsCustomLblTxCenter As String
Public gsCustomLblDrug As String
Public gsCustomLblOrgan As String
Public gsLabelGridColumnCustom1 As String
Public gsLabelGridColumnCustom2 As String
Public gsLabelGridColumnCustom3 As String

'This value is stored in device & indicates the version of data structure within the device.
'This does not relate directly to the version of the host software because the host software
'version can change with meaning that the structure of the data in the device has changed.
'This value should be increased when any kind of change occurs to the custom areas of the device
'such as changing the length of strings to accommodate new features.  The purpose of this value
'is to let us read it back from a device and determine if newer host software is being used on
'a device programmed with another version.

Public Const gsREV_DATA_STRUCTURE = "01"

'There are 4 fields in the device containing 16 characters each.  In the original
'device design, this was intended to contain 4 sepeate pieces of information.
'The length of each data type is as follows:
Public Const giLEN_REV_DATA_STRUCTURE = 2
Public Const giLEN_PATIENT_NAME = 26
Public Const giLEN_ID = 11
Public Const giLEN_DRUG = 2
Public Const giLEN_TX_CENTER = 18
Public Const giLEN_ORGAN = 2

Public Const giMaxDoseTimes = 4            'the max number of prescribed dosing time (entry boxes)
Public Const giDosesPerDayDefault = 2
Public gbPatientDataNotSaved As Boolean    'true once the data in memory has been saved (from device)

Public gdTempDateTime As Double            'ugh, put this var in the form that uses it, can also be done
Public giTempCya As Integer
Public gfTempCreatinine As Single
Public gsTempCustomInfo As String

Public gsActiveFormName As String
```

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```
Public giCurrentTip As Integer              'most recent tip number that was shown
Public gsWebStartingAddress As String       'url address and any associated password for web site
```

```
Public Function ComputeIniSectionChecksum(ByVal sFileSpec As String, ByVal sSection As String)
  'Read each line in the section name of an INI file that was passed here.
  'Compute a unique value and pass back to caller
  On Error GoTo 0   'rgh temp

  Dim lCheckSumTally As Long, r As Integer, l As Long, i As Integer, iKey As Integer
  Dim sLine As String

  'Get the names of all of the keys in this section.
  'A null key field in above line loads all keys in that section
  Dim iStrSize As Integer, sTempBuf As String, iBufSize As Integer
  Dim sKeyList(2000) As String      'make room for this many key names in this section

  sTempBuf = Space$(16384)
  iBufSize = 16384
  l = GetPrivateProfileString(sSection, ByVal 0&, "", sTempBuf, iBufSize, sFileSpec)
  r = ParseDelimString(Left$(sTempBuf, l), Chr$(0), sKeyList())      'put the key names in a list
  For iKey = 1 To r
    sLine = GetINISetting(sFileSpec, sSection, sKeyList(iKey), "")
    For i = 1 To Len(sLine)
      lCheckSumTally = lCheckSumTally + (Asc(Mid$(sLine, i, 1)) * iKey)
    Next i
  Next iKey
  lCheckSumTally = lCheckSumTally Mod 536870912      'a 29 bit number

  ComputeIniSectionChecksum = lCheckSumTally      'pass result back to caller

End Function
```

```
Public Sub EventDelete(DataStruct As DeviceDataStruct, ByVal iIndex As Integer)
  'Remove an event from the data structure.  The index to the position is
  'passed here.

  Dim i As Integer

  'it is not a valid index
  If iIndex < 1 Or iIndex > DataStruct.iEventData(0) Then Exit Sub

  For i = iIndex To DataStruct.iEventData(0)      'move all events up one
    DataStruct.byteEventType(i) = DataStruct.byteEventType(i + 1)
    DataStruct.dEventDate(i) = DataStruct.dEventDate(i + 1)
    DataStruct.iEventData(i) = DataStruct.iEventData(i + 1)
  Next i

  DataStruct.iEventData(0) = DataStruct.iEventData(0) - 1      'decrement event count
  gbPatientDataNotSaved = True      'set flag to indicate that the file has changed but not yet been saved

End Sub
```

General.bas - EventInsert

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```
Public Sub EventInsert(DataStruct As DeviceDataStruct, ByVal iIndex As Integer, ByVal dDate As Double)
    'Insert a new event into the data structure at the index location passed here.  If the index =0
    'then it probably indicates that a previous function could not find where to insert the date
    'in the structure.  In this case, the event must be inserted at the beginning or the end of the
    'structure depending on the date.

    Dim i As Integer

    If iIndex = 0 Then      'date was not found
        If dDate <= DataStruct.dEventDate(1) Then
            iIndex = 1
        Else
            iIndex = DataStruct.iEventData(0)      'insert at last point
        End If
    End If

    If iIndex Then    'there are events in the structure
        For i = DataStruct.iEventData(0) To iIndex Step -1        'move all events down to make room for new one
            DataStruct.byteEventType(i + 1) = DataStruct.byteEventType(i)
            DataStruct.dEventDate(i + 1) = DataStruct.dEventDate(i)
            DataStruct.iEventData(i + 1) = DataStruct.iEventData(i)
            DataStruct.sUserData1(i + 1) = DataStruct.sUserData1(i)
            DataStruct.sUserData2(i + 1) = DataStruct.sUserData2(i)
            DataStruct.sUserData3(i + 1) = DataStruct.sUserData3(i)
        Next I
    Else
        iIndex = iIndex + 1
    End If

    'Now insert the new event
    DataStruct.iEventData(0) = DataStruct.iEventData(0) + 1      'increment event count
    DataStruct.byteEventType(iIndex) = giEVENT_USER_DEFINED
    DataStruct.dEventDate(iIndex) = dDate
    DataStruct.sUserData1(iIndex) = giTempCya                'put change in structure
    DataStruct.sUserData2(iIndex) = gfTempCreatinine          'put change in structure
    DataStruct.sUserData3(iIndex) = gsTempCustomInfo           'put change in structure

    If iIndex = 1 Then    'there were no previous events until this one
        DataStruct.iEventData(iIndex) = 0
    Else
        DataStruct.iEventData(iIndex) = DataStruct.iEventData(iIndex - 1)
    End If
    gbPatientDataNotSaved = True      'set flag to indicate that the file has changed but not yet been saved

End Sub
```

```
Public Function FindPrescibedDoseSizeForSpecificDay(DataStruct As DeviceDataStruct, ByVal lDate As Long)

    'Find the prescribed dose for the day that is passed here.
    'This is accomplished by looking for the most recent dose change
    'event that occurred on or prior to this date.

    Dim i As Integer, iIndex As Integer
    iIndex = FindClosestDateInArray(DataStruct, lDate)
    If iIndex = 0 Then    'all events are occurring after the date requested
        For i = 1 To DataStruct.iEventData(0)      'look through whole array if necessary
            If DataStruct.byteEventType(i) = giEVENT_DOSE_CHANGED Then
                FindPrescibedDoseSizeForSpecificDay = i      'DataStruct.iEventData(i)
                Exit For
            End If
        Next i


    Else  'an event date was found
        For i = iIndex To 1 Step -1
            If DataStruct.byteEventType(i) = giEVENT_DOSE_CHANGED Then
```

General.bas - FindPrescibedDoseSizeForSpeci)ay

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```
            FindPrescibedDoseSizeForSpecificDay = i      'DataStruct.iEventData(i)
            Exit For
        End If

    Next i
End If

End Function
```

```
Public Function CalcDayDoseScore_OnTime(DataStruct As DeviceDataStruct, ByVal IStartingDate As Long) As
    'Computer the dosing score for the day passed here
    'This score tests to see if the dosen taken was within the prescribed time range.
    'Pass the score back to the caller as nearest whole percent.
    'iIndex is the index in the array where computation is to start.
    'It should already be set to the first event that occurred on that day.

    Dim I As Long, i As Integer, iTotalDoses As Integer
    Dim iIndex As Integer, r As Integer

    iIndex = FindClosestDateInArray(DataStruct, IStartingDate)      'returns 0 if date is not found
    If iIndex Then    'an event was found
        Do    'look at all past events for the past iScoreDays
            If Int(DataStruct.dEventDate(iIndex)) = IStartingDate Then
                'date still in range. ok to continue
                If DataStruct.byteEventType(iIndex) = giEVENT_DOSE_TAKEN Then    'this is a medication
                    'Now test to see if time is within the daily prescribed range
                    r = IsDoseWithinPrescribedTimeRange(DataStruct, iIndex)      'pass index to event time
                    If r Then iTotalDoses = iTotalDoses + 1
                End If
                iIndex = iIndex + 1
            Else
                Exit Do
            End If
        Loop

        CalcDayDoseScore_OnTime = 100 * iTotalDoses / DataStruct.iDosesPerDay
    End If

End Function
```

```
Public Function CalcDayDoseScore_AllDoses(DataStruct As DeviceDataStruct, ByVal IStartingDate As Long) A
    'Computer the dosing score for the day passed here.
    'Calculate for all doses taken on that day regardless of if they were taken on time or not.
    'Pass the score back to the caller as nearest whole percent.
    'iIndex is the index in the array where computation is to start.
    'It should already be set to the first event that occurred on that day.

    Dim iTotalDoses As Integer, iIndex As Integer

    iIndex = FindClosestDateInArray(DataStruct, IStartingDate)
    If iIndex Then    'an event was found on this date
        Do    'look at all dosing events for this day
            If Int(DataStruct.dEventDate(iIndex)) = IStartingDate Then
            'date still in range. ok to continue
            'this is a medication
            If DataStruct.byteEventType(iIndex) = giEVENT_DOSE_TAKEN Then iTotalDoses = iTotalDoses + 1
                iIndex = iIndex + 1
            Else
                Exit Do
            End If
        Loop

        CalcDayDoseScore_AllDoses = 100 * iTotalDoses / (DataStruct.iDosesPerDay)
    End If
```

```
End Function

Public Function CalcDosesSumTakenOnSpecificDay(DataStruct As DeviceDataStruct, ByVal lStartingDate As l
  'Computer the dosing total number of doses taken on a specific date
  'Note, this calculation does not take into consideration whether or not the dose
  'was taken within the prescribed time.  This is all doses for a particular day
  'Pass the count back to the caller.

  Dim iTodayDoseCount As Integer, iIndex As Integer

  iIndex = FindFirstMatchingDateInArray(DataStruct, lStartingDate)
  If iIndex Then   'an event was found on this date
    Do   'look at all dosing events for this day
      If Int(DataStruct.dEventDate(iIndex)) = lStartingDate Then
        'date still in range, ok to continue
        'this is a medication
        If DataStruct.byteEventType(iIndex) = giEVENT_DOSE_TAKEN Then iTodayDoseCount = iTodayDoseCount + 1
        iIndex = iIndex + 1    'goto next higher event in array
        'exit if at end of array (prevents error)

        If UBound(DataStruct.dEventDate()) = iIndex Then Exit Do

        'exit if no data in array
        If iIndex > Int(DataStruct.iEventData(0)) Then Exit Do

      Else
        Exit Do
      End If
    Loop

    CalcDosesSumTakenOnSpecificDay = iTodayDoseCount
  End If

End Function

Public Sub EraseDataInMemory(DataStruct As DeviceDataStruct)
  Dim i As Integer

  'clear out any data that may be in memory and initialize the arrays
  DataStruct.sPatientLastName = ""
  DataStruct.sPatientFirstName = ""
  DataStruct.sPatientID = ""
  DataStruct.sDrug = ""
  DataStruct.sOrgan = ""
  DataStruct.sTxCenter = ""
  DataStruct.sSerialNumber = ""
  DataStruct.sFirmwareVer = ""
  DataStruct.sDoseSize = ""
  DataStruct.sPatientDataFileName = ""

  For i = 0 To giMaxDoseTimes
    DataStruct.dPrescribedDoseTime(i) = -1
  Next i

  DataStruct.iDosesPerDay = 0
  DataStruct.sDoseResolution = ""
  DataStruct.sMedRemaining = ""

  Erase DataStruct.sScoreData
  Erase DataStruct.iEventData
  Erase DataStruct.dEventDate
  Erase DataStruct.byteEventType    'erases all elements of a fixed array

  Erase DataStruct.sUserData1
  Erase DataStruct.sUserData2
```

```
    Erase DataStruct.sUserData3

    DataStruct.lDeviceInitDate = 0
    DataStruct.sBatteryChangeTimer = ""
    DataStruct.sDoseLockoutHours = ""

    DataStruct.bErrorFatal = False
    DataStruct.bErrorNonFatal = False
    DataStruct.bErrorDoseSize = False
    DataStruct.bErrorMedRemaining = False
    DataStruct.bErrorMemoryFull = False
    DataStruct.bErrorsExist = False
    DataStruct.bErrorBrownOut = False
    DataStruct.dLastDownloadDate = 0

    gbPatientDataNotSaved = False

End Sub
```

```
Public Sub CreateTxtSummaryFile()
    'This routine creates a temp text file in the "fax" subdirectory
    'This will allow the information to be faxed as a text document.

    Dim i As Integer, r As Integer, sFileSpec As String, lErrorCode As Long
    Dim sLblName As String, sLblID As String, sLblTxCenter As String, sLblDrug As String, sLblOrgan As String

    'Get rid of the previous temporary file.
    'sFileSpec = App.Path + "\faxes\temp.txt"
    sFileSpec = App.Path + "\faxes\" + PAT_DATA.sPatientLastName + ", " + PAT_DATA.sPatientFirstName + " " + PAT_DATA.sPatientID + ".
    txt"
    r = FileExists(sFileSpec, lErrorCode)
    If r Then Kill sFileSpec

    sLblName = gsCustomLblPatientLastName
    sLblID = gsCustomLblPatientID
    sLblTxCenter = gsCustomLblTxCenter
    sLblDrug = gsCustomLblDrug
    sLblOrgan = gsCustomLblOrgan

    Open sFileSpec For Output Shared As #1
    Print #1, sLblName + ":  " + PAT_DATA.sPatientLastName + " " + PAT_DATA.sPatientFirstName
    Print #1, sLblID + ":  " + PAT_DATA.sPatientID
    Print #1, sLblTxCenter + ":  " + PAT_DATA.sTxCenter
    Print #1, sLblDrug + ":  " + PAT_DATA.sDrug
    Print #1, sLblOrgan + ":  " + PAT_DATA.sOrgan
    Print #1,
    Print #1, "Device Serial Number:  " + PAT_DATA.sSerialNumber
    Print #1, "FirmWare Version:  " + PAT_DATA.sFirmwareVer
    Print #1, "Last Download Date:  " + Format$(PAT_DATA.dLastDownloadDate, gsDateDisplayFormat)
    Close #1

    'rgh: ensure that the complete file is printed

End Sub
```

General.bas - FileExists

7

```
Function FileExists(ByVal sPath As String, lErrorCode As Long) As Integer
'Check for existence of a file by attempting an OPEN.
'Return true (-1) if exists else return False (0) or error condition
'Note that since this function tries to open a file, an error could
'return to caller if file is there but in use by another application.
'-----------------------------------------------------------

    Dim X As Integer

    X = FreeFile
    On Error Resume Next
    Open sPath For Input As X
    Close X
    If Err = 0 Then
        FileExists = True
        lErrorCode = 0          'clear error code
    Else
        FileExists = False      'set flag for error
        lErrorCode = Err        'pass error back to caller
    End If

End Function
```

```
Public Function GetINISetting(sFileSpec As String, sSection As String, sKeyField As String, sDefault As String
    Dim lStrSize As Integer, sTempBuf As String, iBufSize As Integer
    sTempBuf = Space$(1024)
    iBufSize = 1024

    lStrSize = GetPrivateProfileString(sSection, sKeyField, sDefault, sTempBuf, lBufSize, sFileSpec)
    If lStrSize Then
        GetINISetting = Trim$(Left$(sTempBuf, lStrSize))
    Else
        GetINISetting = sDefault
    End If

End Function
```

```
Public Function GetPatientDataFromDisk(ByVal sFileSpec As String, DataStruct As DeviceDataStruct, lErrorRe

    'Get all of the patient data from the file on disk and place into memory.
    'The filename that is passed here must be a valid patient file and verified
    'by the calling procedure.
    Dim sSection As String, I As Integer, sTemp As String, r As Integer
    Dim lFileChecksum As Long, lCheckSumTally As Long

    On Error GoTo GetPatientDataFromDisk_Error

    'Read the file and calculate the checksum.
    lFileChecksum = ComputeIniSectionChecksum(sFileSpec, "Device Data")
    lCheckSumTally = GetINISetting(sFileSpec, "General", "Device Data Validation", 0)
    If lFileChecksum <> lCheckSumTally Then
        lErrorReturn = ERR_DATA_CHECKSUM
        Exit Function
    End If

    lFileChecksum = ComputeIniSectionChecksum(sFileSpec, "Event Data")
    lCheckSumTally = GetINISetting(sFileSpec, "General", "Event Data Validation", 0)
    If lFileChecksum <> lCheckSumTally Then
        lErrorReturn = ERR_DATA_CHECKSUM
        Exit Function
    End If
```

General.bas - GetPatientDataFromDisk


```
    lFileChecksum = ComputeIniSectionChecksum(sFileSpec, "Device Error Flags")
    lCheckSumTally = GetINISetting(sFileSpec, "General", "Device Error Flags Validation", 0)
    If lFileChecksum <> lCheckSumTally Then
        lErrorReturn = ERR_DATA_CHECKSUM
        Exit Function
    End If


    sSection = "Device Error Flags"
    DataStruct.bErrorFatal = CBool(GetINISetting(sFileSpec, sSection, "Fatal", False))
    DataStruct.bErrorNonFatal = CBool(GetINISetting(sFileSpec, sSection, "Non Fatal", False))
    DataStruct.bErrorDoseSize = CBool(GetINISetting(sFileSpec, sSection, "Dose Size", False))
    DataStruct.bErrorMedRemaining = CBool(GetINISetting(sFileSpec, sSection, "Med Remaining", False))
    DataStruct.bErrorMemoryFull = CBool(GetINISetting(sFileSpec, sSection, "Memory Full", False))
    DataStruct.bErrorBrownOut = CBool(GetINISetting(sFileSpec, sSection, "Brownout", False))


    sSection = "Device Data"
    EraseDataInMemory DataStruct

    sTemp = GetINISetting(sFileSpec, sSection, "Device Init Date", 0)
    If IsDate(sTemp) Then
        DataStruct.lDeviceInitDate = DateValue(sTemp)
    End If

    sTemp = GetINISetting(sFileSpec, sSection, "Events Ref Date Time", 0)
    If IsDate(sTemp) Then
        DataStruct.dDeviceRefDateTime = DateValue(sTemp)
    End If

    sTemp = GetINISetting(sFileSpec, sSection, "Last Download Date", "0")
    If IsDate(sTemp) Then
        DataStruct.dLastDownloadDate = DateValue(sTemp)
    End If

    DataStruct.sPatientLastName = GetINISetting(sFileSpec, sSection, "Last Name", "")
    DataStruct.sPatientFirstName = GetINISetting(sFileSpec, sSection, "First Name", "")
    DataStruct.sPatientID = GetINISetting(sFileSpec, sSection, "Patient ID", "")
    DataStruct.sTxCenter = GetINISetting(sFileSpec, sSection, "Tx Center", "")
    i = CInt(GetINISetting(sFileSpec, sSection, "Organ Reference Number", "0"))
    If i And i <= UBound(gsOrganNames) Then DataStruct.sOrgan = gsOrganNames(i)
    i = CInt(GetINISetting(sFileSpec, sSection, "Drug Reference Number", "0"))
    If i And i <= UBound(gsDrugNames) Then DataStruct.sDrug = gsDrugNames(i)
    DataStruct.sSerialNumber = GetINISetting(sFileSpec, sSection, "Serial Number", "")
    DataStruct.sFirmwareVer = GetINISetting(sFileSpec, sSection, "Firmware Version", "")
    DataStruct.sDoseSize = GetINISetting(sFileSpec, sSection, "Dose Size", "")
    DataStruct.lDosesPerDay = CInt(GetINISetting(sFileSpec, sSection, "Doses Per Day", "0"))
    DataStruct.sDoseResolution = GetINISetting(sFileSpec, sSection, "Dose Resolution", "")
    DataStruct.sMedRemaining = GetINISetting(sFileSpec, sSection, "Medication Remaining", "")
    DataStruct.sBatteryChangeTimer = GetINISetting(sFileSpec, sSection, "Battery Change Timer", "")
    DataStruct.sDoseLockoutHours = GetINISetting(sFileSpec, sSection, "Lockout Hours Between Doses", "")

    For i = 1 To 14
        DataStruct.sScoreData(i) = GetINISetting(sFileSpec, sSection, "Patient Score Data " + CStr(i), "")
    Next i


    For i = 1 To giMaxDoseTimes
        sTemp = GetINISetting(sFileSpec, sSection, "Prescribed Dose Time " + CStr(i), "-1")
        DataStruct.dPrescribedDoseTime(i) = -1        ' default value
        If IsDate(sTemp) Then DataStruct.dPrescribedDoseTime(i) = CDate(sTemp)
    Next i

    DataStruct.iEventData(0) = CInt(GetINISetting(sFileSpec, "Event Data", "Event Count", "0"))

    Dim sTempList(10) As String
    For i = 1 To DataStruct.iEventData(0)
```

General.bas - GetPatientDataFromDisk

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```
        sTemp = GetINISetting(sFileSpec, "Event Data", CStr(i), "")
        r = ParseDelimString(sTemp, ",", sTempList())
        DataStruct.dEventDate(i) = CDate(sTempList(1))
        Select Case Trim$(LCase$(sTempList(2)))
          Case "dose taken"
            DataStruct.byteEventType(i) = giEVENT_DOSE_TAKEN
            DataStruct.iEventData(i) = sTempList(3)

          Case "dose change"
            DataStruct.byteEventType(i) = giEVENT_DOSE_CHANGED
            DataStruct.iEventData(i) = sTempList(3)

          Case "custom event"
            DataStruct.byteEventType(i) = giEVENT_USER_DEFINED
            DataStruct.iEventData(i) = sTempList(3)

        End Select
        DataStruct.sUserData1(i) = sTempList(4)
        DataStruct.sUserData2(i) = sTempList(5)
        DataStruct.sUserData3(i) = sTempList(6)
    Next i

    '   bErrorFatal As Boolean        'true if this flag was set in the returned flags string
    '   bErrorNonFatal As Boolean     'true if this flag was set in the returned flags string
    '   bErrorDoseSize As Boolean     'true if this flag was set in the returned flags string
    '   bErrorMedRemaining As Boolean 'true if this flag was set in the returned flags string
    '   bErrorMemoryFull As Boolean   'true if this flag was set in the returned flags string
    '   bErrorBrownOut As Boolean     'true if this flag was set in the returned flags string
    '   bErrorsExist As Boolean       '(1 byte) Bits are set if various errors have occurred and have not
    GetPatientDataFromDisk = True     'return success flag to caller

GetPatientDataFromDisk_Exit:
  Exit Function

GetPatientDataFromDisk_Error:
  lErrorReturn = Err
  Resume GetPatientDataFromDisk_Exit

  End Function
```

```
Public Sub GetProgramPreferences()
  'Load the program and user preferences into the global variables
  Dim lStrSize As Integer, l As Integer, sFileSpec As String, r As Integer
  Dim sSection As String
  sSection = "Preferences"
  gsDateDisplayFormat = GetINISetting(gsAppIniFileSpec, sSection, "Date Display Format", "Short Date")
  gsTimeDisplayFormat = GetINISetting(gsAppIniFileSpec, sSection, "Time Display Format", "Short Time")
  gsngComplianceTimeRange = CSng(GetINISetting(gsAppIniFileSpec, sSection, "Compliance Time Range", "2"))

  sSection = "Custom Settings"
  'Get any custom field labels that may be in the INI file.  If none exist the set some defaults here.
  gsCustomLblPatientLastName = GetINISetting(gsAppIniFileSpec, sSection, "Last Name Label", "")
  If gsCustomLblPatientLastName = "" Then gsCustomLblPatientLastName = "Last Name"

  gsCustomLblPatientFirstName = GetINISetting(gsAppIniFileSpec, sSection, "First Name Label", "")
  If gsCustomLblPatientFirstName = "" Then gsCustomLblPatientFirstName = "First Name"

  gsCustomLblPatientID = GetINISetting(gsAppIniFileSpec, sSection, "Patient ID Label", "")
  If gsCustomLblPatientID = "" Then gsCustomLblPatientID = "Patient ID"

  gsCustomLblTxCenter = GetINISetting(gsAppIniFileSpec, sSection, "TX Center Label", "")
  If gsCustomLblTxCenter = "" Then gsCustomLblTxCenter = "TX Center"

  gsCustomLblDrug = GetINISetting(gsAppIniFileSpec, sSection, "Drug Label", "")
  If gsCustomLblDrug = "" Then gsCustomLblDrug = "Drug"
```

General.bas - GetProgramPreferences

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```
gsCustomLblOrgan = GetINISetting(gsAppIniFileSpec, sSection, "Organ Label", "")
If gsCustomLblOrgan = "" Then gsCustomLblOrgan = "Organ"

gsLabelGridColumnCustom1 = GetINISetting(gsAppIniFileSpec, sSection, "Grid Column 1", "")
If gsLabelGridColumnCustom1 = "" Then gsLabelGridColumnCustom1 = "CYA Level (ng/ml)"

gsLabelGridColumnCustom2 = GetINISetting(gsAppIniFileSpec, sSection, "Grid Column 2", "")
If gsLabelGridColumnCustom2 = "" Then gsLabelGridColumnCustom2 = "Creatinine (mg/dl)"

gsLabelGridColumnCustom3 = GetINISetting(gsAppIniFileSpec, sSection, "Grid Column 3", "")
If gsLabelGridColumnCustom3 = "" Then gsLabelGridColumnCustom3 = "Custom"


'Get the list of most recently used files to the menu
For i = 1 To frmMain.mnuFileMRU.UBound
   frmMain.mnuFileMRU(i).Tag = GetINISetting(gsAppIniFileSpec, "Recent Files", CStr(i), "")
   If frmMain.mnuFileMRU(i).Tag <> "" Then
      frmMain.mnuFileMRU(i).Visible = True
      'strip the filespec away from the tag and put into the caption for display purposes
      r = GetFileNameFromSpec(frmMain.mnuFileMRU(i).Tag, sFileSpec)      'hold the name of the file
      frmMain.mnuFileMRU(i).Caption = sFileSpec
      frmMain.mnuFileBar6.Visible = True
   End If
Next i

'Get last values for the Fax control that was last set by user
sSection = "User Selections"
With FAX_DATA
   .sSenderName = GetINISetting(gsFaxFileSpec, sSection, "Sender Name", "")
   .sSenderCompany = GetINISetting(gsFaxFileSpec, sSection, "Sender Company", "")
   .sSenderVoiceNumber = GetINISetting(gsFaxFileSpec, sSection, "Sender Voice Number", "")
   .sSenderFaxNumber = GetINISetting(gsFaxFileSpec, sSection, "Sender Fax Number", "")
   .sFaxID = GetINISetting(gsFaxFileSpec, sSection, "Fax ID", "")
   .sDialPrefix = GetINISetting(gsFaxFileSpec, sSection, "Dial Prefix", "")
   .iRetries = CInt(GetINISetting(gsFaxFileSpec, sSection, "Retries", "0"))
   .iRetryInterval = CInt(GetINISetting(gsFaxFileSpec, sSection, "Retry Interval", "1"))
   .bFaxResolution = GetINISetting(gsFaxFileSpec, sSection, "Resolution", "0")
End With


'Get the Drug types from file and place in global list
'  sSection = "Transplant Centers"
'  TxCenters(0) = GetINISetting(gsAppIniFileSpec, sSection, "Count", "0")
'  For i = 1 To TxCenters(0)
'     TxCenters(i) = GetINISetting(gsAppIniFileSpec, sSection, CStr(i), "0")
'  Next i


'Get the Drug types from file and place in global list
sSection = "Drugs"
gsDrugNames(0) = GetINISetting(gsAppIniFileSpec, sSection, "Count", "0")
For i = 1 To gsDrugNames(0)
   gsDrugNames(i) = GetINISetting(gsAppIniFileSpec, sSection, CStr(i), "0")
Next i

'Get the Drug types from file and place in global list
sSection = "Organs"
gsOrganNames(0) = GetINISetting(gsAppIniFileSpec, sSection, "Count", "0")
For i = 1 To gsOrganNames(0)
   gsOrganNames(i) = GetINISetting(gsAppIniFileSpec, sSection, CStr(i), "0")
Next i

giCurrentTip = CInt(GetINISetting(gsAppIniFileSpec, "Options", "Current Tip", 1))

'Get settings of calendar form
CAL_DEFAULTS.chkDosesMissed = CByte(GetINISetting(gsAppIniFileSpec, "Calendar Settings", "chkDosesMissed", 1))
CAL_DEFAULTS.chkDosesNotComplied = CByte(GetINISetting(gsAppIniFileSpec, "Calendar Settings", "chkDosesNotComplied", 1))
```

General.bas - GetProgramPreferences


```
    CAL_DEFAULTS.chkDosesTaken = CByte(GetINISetting(gsAppIniFileSpec, "Calendar Settings", "chkDosesTaken", 0))
    CAL_DEFAULTS.chkDoseChanged = CByte(GetINISetting(gsAppIniFileSpec, "Calendar Settings", "chkDoseChanged", 1))

    'Get Settings of Patient summary form
    PAT_SUM_DEFAULTS.cmboDataToView = CByte(GetINISetting(gsAppIniFileSpec, "Patient Summary Settings", "cmboDataToView", 1
    ))
    PAT_SUM_DEFAULTS.cmboChartType = CByte(GetINISetting(gsAppIniFileSpec, "Patient Summary Settings", "cmboChartType", 1))


    'Get the web address for the browser
    gsWebStartingAddress = "http://"
    gsWebStartingAddress = gsWebStartingAddress + GetINISetting(gsAppIniFileSpec, "Web Data", "User Name", "") + ":"
    gsWebStartingAddress = gsWebStartingAddress + GetINISetting(gsAppIniFileSpec, "Web Data", "Access", "") + "@"
    gsWebStartingAddress = gsWebStartingAddress + GetINISetting(gsAppIniFileSpec, "Web Data", "URL", "")

End Sub
```

Sub Main()

```
    Dim I As Long, r As Integer, i As Integer, sMSG As String, sTemp As String, dTime As Double
    Dim bBrowserFound As Boolean, lLastAccessDate As Long, lNextReminderDate As Long

    'Initialize some application settings
    gsAppIniFileSpec = App.Path + "\" + "CycloTech.ini"
    gsFaxFileSpec = App.Path + "\Fax.ini"
    gsTempBuf = Space$(1024)
    gbCommOK = 99          'set to some value other than true or false to properly initialize the dialog

    frmSplash.Show
    frmSplash.Refresh
    dTime = Now            'get the time value of now

    Wait 0.75
    frmLogin.Show vbModal
    If Not frmLogin.OK Then End        'Login Failed so exit app
    Unload frmLogin
    DoEvents


    'rgh note that the debug flag is turned on and the fax icon is hidden
    ' I = Shell(App.Path + "\Faxman32.exe /D /H", 1)   'start the fax server
    I = Shell("Faxman32.exe /H", 1)     'start the fax server
    Load frmMain
    Set gcFax = frmMain.FaxMan1

    'If browser feature is turned on in the ini file, then activate item on the menu.
    'See if we should allow access to visit Sangstat on the Internet
    r = CBool(GetINISetting(gsAppIniFileSpec, "Web Data", "Active", "False"))
    If r = False Then frmMain.mnuAccessWebSite.Visible = False        'no key found in ini file


    Comm_InitializeCommPort     'initialize the comm port from INI file settings
    GetProgramPreferences
    EraseDataInMemory PAT_DATA
    EraseDataInMemory TEMP_DATA

    'Set some menu items
    frmMain.mnuFileSave.Enabled = False
    frmSplash.ZOrder

    Do
      If CDbl(Now) > dTime + 0.00005 Then Exit Do       'wait for a minimum amount of time before unloading splash screen
      DoEvents
    Loop
```

General.bas - Main

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```
Unload frmSplash

frmMain.Show
SetPrinterIcon False, ""

'See if we should shown tips at startup
r = CBool(GetINISetting(gsAppIniFileSpec, "Options", "Show Tips at Startup", True))
If r Then frmTip.Show

'See if we should remind user to visit Sangstat on the Internet
If frmMain.mnuAccessWebSite.Visible = True Then      'user must have menu selection on to access web
   'Try to find a browser by looking in different locations in the registry
   frmMain.MhIni1.Key = ClassesRoot
   frmMain.MhIni1.EntrySection = "HTTP\shell\open\Command"
   frmMain.MhIni1.EntryItem = ""                     'gets the default value
   frmMain.MhIni1.Action = 13                        'get registry key
   If Len(Trim(frmMain.MhIni1.EntryValue)) > 0 Then
      bBrowserFound = True       'Looks like a value is there
   End If

   frmMain.MhIni1.Key = LocalMachine
   frmMain.MhIni1.EntrySection = "\SOFTWARE\Classes\HTTP\shell\open\command"
   frmMain.MhIni1.EntryItem = ""                     'gets the default value
   frmMain.MhIni1.Action = 13                        'get registry key
   If Len(Trim(frmMain.MhIni1.EntryValue)) > 0 Then
      bBrowserFound = True       'Looks like a value is there
   End If


   If bBrowserFound Then
      lLastAccessDate = 0
      sTemp = GetINISetting(gsAppIniFileSpec, "Web Data", "Last Web Visit Date", "")
      If IsDate(sTemp) Then lLastAccessDate = DateValue(sTemp)

      lNextReminderDate = 0
      sTemp = GetINISetting(gsAppIniFileSpec, "Web Data", "Next Web Visit Reminder Date", "")
      If IsDate(sTemp) Then lNextReminderDate = DateValue(sTemp)

      'On this line, if L is negative then it indicates that the user chose to not connect
      'the last time he/she was reminded.  In this case we wait a much
      'shorter period of time before reminding them again.
      If DateValue(Now) >= lNextReminderDate Then      'it's been too long since the user was last on the web.
         If lLastAccessDate > 0 Then
            sMSG = "You last connected to our internet web site on " + sTemp + ".  "
         Else
            sMSG = "You have not yet connected to our internet web site.  "
         End If

         sMSG = sMSG + "There may be a program update or other valuable information there."
         sMSG = sMSG + vbCrLf + vbCrLf + "Would you like to connect to the web site now?  (you must already have web access available
         )"
         Beep
         r = MsgBox(sMSG, vbQuestion + vbYesNo + vbDefaultButton2, "Internet Connection Reminder")
         'regardless of the answer to the next question, set a minimum time to ask user again.
         'If user actually connects to internet, then this time is overwritten with a longer one by the browser.
         SaveINISetting gsAppIniFileSpec, "Web Data", "Next Web Visit Reminder Date", Format$(Now + 15, "Medium Date")

         If r = vbYes Then
            Call LogonToWebSite
         End If
      End If
   End If
End If

End Sub
```

```
Public Sub LogonToWebSite()
  'Visit Sangstat on the Internet
  'Dim frmB As New frmBrowser
  'Load frmBrowser
  frmBrowser.StartingAddress = gsWebStartingAddress
  DoEvents    'allow time to paint
  DoEvents    'allow time to paint
  frmBrowser.Refresh
  frmBrowser.Show
End Sub
```

```
Public Function OpenPatientData(ByVal sFileSpec As String) As Integer
  'Open patient data file and load to memory
  'Return a true if load was successful, false if not, and vbCancel if user cancelled

  Dim r As Integer, sTemp As String, lErrorCode As Long
  On Error GoTo OpenPatientData_Error

  r = ValidatePatientDataSaved    'make sure any device data has first been saved
  If r = vbCancel Then Exit Function

  'Get a filename from the common dialog
  'Setup the common dialog control prior to showing it
  With frmMain.dlgCommonDialog
     .Flags = cdlOFNOverwritePrompt Or cdlOFNPathMustExist Or cdlOFNExplorer Or cdlOFNExtensionDifferent Or
     cdlOFNNoReadOnlyReturn Or cdlOFNHideReadOnly Or cdlOFNFileMustExist
     .CancelError = True          'generate error if CANCEL button is pressed
     .InitDir = App.Path + "\Patient Data"
     .Filter = "CycloTech Data File                *.cpd|*.cpd"
     .DialogTitle = "Open Patient Data File"
     .DefaultExt = "CPD"       'append "Structure" extention when saving.
     If sFileSpec <> "" Then .filename = sFileSpec
     .ShowOpen              'Open dialog
  End With

  'Now get the data from file
  frmMain.MousePointer = vbHourglass
  DoEvents

  r = GetPatientDataFromDisk(frmMain.dlgCommonDialog.filename, PAT_DATA, lErrorCode)
  If r <> True Then
     If lErrorCode = ERR_DATA_CHECKSUM Then
        sTemp = "The contents of the data file have changed since it was last saved.  "
        sTemp = sTemp + "This could be due to a corrupt file, but is more likely that the file was manually changed."
        sTemp = sTemp + vbCrLf + vbCrLf + "The file will not be loaded."
        Beep
        MsgBox sTemp, vbCritical, "File Contents Changed"
     Else
        MsgBox "An error occurred while retrieving data from the file.  It was not read.", vbExclamation, "Error In File  -  " + Error(r)
     End If
  End If


  PAT_DATA.sPatientDataFileName = frmMain.dlgCommonDialog.filename
  OpenPatientData = True
  r = GetFileNameFromSpec(PAT_DATA.sPatientDataFileName, sTemp)        'hold the name of the file
  'UpDateRecentFileMenu sFileSpec
  UpDateRecentFileMenu sTemp
  frmMain.mnuFileSave.Enabled = True

OpenPatientData_Exit:
  On Error GoTo 0
  RefreshAllOpenForms
  frmMain.MousePointer = vbDefault
  Exit Function
```

General.bas - OpenPatientData

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```
OpenPatientData_Error:
    If Err = cdlCancel Then                    'cancel button was pressed in dialog
        OpenPatientData = vbCancel
        Resume OpenPatientData_Exit
    Else
        Beep
        MsgBox "The CycloTech Data file contains invalid data and can not be read.", vbExclamation, "Invalid Data File - " + Error
        PAT_DATA.sPatientDataFileName = ""
        frmMain.mnuFileSave.Enabled = False
    End If
    OpenPatientData = False
    Resume OpenPatientData_Exit      'exit anyway for now

End Function
```

```
Public Sub PopulateDeviceDiagDialog(DataStruct As DeviceDataStruct, SourceForm As Form)
    'There are two possible dialogs that have the same controls on them.
    'This common procedure will populate both
    Dim i  As Integer
        . .
    With SourceForm
      'Show custom labels from config file if there were any
      .Label1(3) = gsCustomLblPatientLastName
      .Label1(1) = gsCustomLblPatientFirstName
      .Label1(5) = gsCustomLblPatientID
      .Label1(6) = gsCustomLblTxCenter
      .Label1(7) = gsCustomLblDrug
      .Label1(0) = gsCustomLblOrgan


      If TypeOf .txtDrug Is SSPanel Then
          .txtDrug = DataStruct.sDrug

      ElseIf TypeOf .txtDrug Is ComboBox Then      'it is a list box
          .txtDrug.Clear
          For i = 1 To gsDrugNames(0)          'fill the drugs list box with available choices
              .txtDrug.AddItem gsDrugNames(i)
          Next i

          For i = 0 To .txtDrug.ListCount - 1
              If .txtDrug.List(i) = DataStruct.sDrug Then
                  .txtDrug.ListIndex = i
                  Exit For
              End If
          Next i
      End If


      If TypeOf .txtOrgan Is SSPanel Then
          .txtOrgan = DataStruct.sOrgan

      ElseIf TypeOf .txtOrgan Is ComboBox Then      'it is a list box
          .txtOrgan.Clear
          For i = 1 To gsOrganNames(0)          'fill the drugs list box with available choices
              .txtOrgan.AddItem gsOrganNames(i)
          Next i

          For i = 0 To .txtOrgan.ListCount - 1
              If .txtOrgan.List(i) = DataStruct.sOrgan Then
                  .txtOrgan.ListIndex = i
                  Exit For
              End If
          Next i

      End If


      .txtPatientLastName = DataStruct.sPatientLastName
```

General.bas - PopulateDeviceDiagDialog


```
    .txtPatientFirstName = DataStruct.sPatientFirstName
    .txtPatientID = DataStruct.sPatientID
    .txtTxCenter = DataStruct.sTxCenter
    .txtSerialNumber = DataStruct.sSerialNumber
    .txtDoseSize = DataStruct.sDoseSize

    .txtPatientLastName.SetFocus

    If DataStruct.iEventData(0) Then
        .txtEventCount = " " + CStr(DataStruct.iEventData(0)) + " "
    Else
        .txtEventCount = ""
    End If

    For i = 1 To giMaxDoseTimes
        If DataStruct.dPrescribedDoseTime(i) >= 0 Then .txtDoseTime(i) = Format$(DataStruct.dPrescribedDoseTime(i),
        gsTimeDisplayFormat)
    Next i

    .txtDosesPerDay = CStr(DataStruct.iDosesPerDay)
    .txtDoseResolution = DataStruct.sDoseResolution
    .txtDoseLockoutHours = DataStruct.sDoseLockoutHours
    If DataStruct.lDeviceInitDate Then
        .txtDeviceStarted = " " + Format$(CDate(DataStruct.lDeviceInitDate), "Medium Date")
    End If

    .txtMedicationRemaining = " " + DataStruct.sMedRemaining
    .txtBatteryChangeTimer = " " + DataStruct.sBatteryChangeTimer
    .txtFirmwareVer = " " + DataStruct.sFirmwareVer

    'set indicators for error flags
    If DataStruct.bErrorFatal Then
        .imgFatal.Picture = .imgError.Picture
    Else
        .imgFatal.Picture = .imgNoError.Picture
    End If

    If DataStruct.bErrorNonFatal Then
        .imgNonFatal.Picture = .imgError.Picture
    Else
        .imgNonFatal.Picture = .imgNoError.Picture
    End If

    If DataStruct.bErrorDoseSize Then
        .imgDoseSize.Picture = .imgError.Picture
    Else
        .imgDoseSize.Picture = .imgNoError.Picture
    End If

    If DataStruct.bErrorMedRemaining Then
        .imgMedRemaining.Picture = .imgError.Picture
    Else
        .imgMedRemaining.Picture = .imgNoError.Picture
    End If

    If DataStruct.bErrorMemoryFull Then
        .imgMemoryFull = .imgError.Picture
    Else
        .imgMemoryFull.Picture = .imgNoError.Picture
    End If

    If DataStruct.bErrorBrownOut Then
        .imgBrownOut = .imgError.Picture
    Else
        .imgBrownOut.Picture = .imgNoError.Picture
    End If

End With
```

General.bas - PopulateDeviceDiagDialog


```
End Sub

Public Sub RefreshAllOpenForms()
  Dim r As Integer

  'if any of these forms are open at the time a new file is loaded.
  'then refresh them.
  For r = 0 To Forms.Count - 1
    Select Case Forms(r).Name
      Case "frmPatientDosingReport"
        frmPatientDosingReport.UpdatefrmPatientDosingReportHeader
        frmPatientDosingReport.UpdatePatientGridDisplay

      Case "frmDosingCalendar"
        If PAT_DATA.dEventDate(PAT_DATA.iEventData(0)) > 0 Then frmDosingCalendar.Calendar.Date = CVDate(PAT_DATA.
        dEventDate(PAT_DATA.iEventData(0)))
        UpdateCalendar

      Case "frmPrint"
        RefreshPreview

      Case "frmPatientSummary"
        frmPatientSummary.UpDatefrmPatientSummaryHeader
        frmPatientSummary.cmboDateSelection_Click
        'frmPatientSummary.UpdatePatientDosingGraph

      Case "frmDeviceInitialize"
        PopulateDeviceCommDialog PAT_DATA, frmDeviceInitialize

      Case "frmReadDeviceData"
        PopulateDeviceCommDialog PAT_DATA, frmReadDeviceData

    End Select
  Next r

End Sub

Public Sub SetPrinterIcon(bEnable As Boolean, sTip As String)
  On Error Resume Next
  frmMain.mnuFilePrint.Enabled = bEnable
  If sTip = "" Then
    frmMain.mnuFilePrint.Caption = "Print..."
  Else
    frmMain.mnuFilePrint.Caption = sTip
  End If
  frmMain.tbToolBar.Buttons.Item(5).Enabled = bEnable
  frmMain.tbToolBar.Buttons.Item(5).ToolTipText = sTip

  'If the active form is not the print form, then keep the name of the
  'form in the key property of the icon.  This is so that the print
  'form will know what kind of information to display and print.
  If frmMain.ActiveForm.Name <> "frmPrint" Then gsActiveFormName = frmMain.ActiveForm.Name
  On Error GoTo 0
End Sub
```

General.bas - UpDateRecentFileMenu


```
Public Sub UpDateRecentFileMenu(ByVal sFileSpec As String)
  'Add the newest FileName to the menulist and move the other ones down.
  On Error GoTo 0

  Dim bDuplicateFound As Boolean, i As Integer, r As Integer, sFileName As String
  r = GetFileNameFromSpec(sFileSpec, sFileName)        'hold the name of the file

  With frmMain
  For i = 1 To .mnuFileMRU.UBound - 1
    If LCase$(.mnuFileMRU(i).Caption) = LCase$(sFileName) Then        'remove any duplicates that might appear
      .mnuFileMRU(i).Caption = ""
      .mnuFileMRU(i).Tag = ""
      bDuplicateFound = True
    End If
  Next i

  For i = .mnuFileMRU.UBound - 1 To 1 Step -1
    If .mnuFileMRU(i).Caption <> "" Then      'contains a filename  ok to shift down
      .mnuFileMRU(i + 1).Caption = .mnuFileMRU(i).Caption        'holds filename only for display purposes
      .mnuFileMRU(i + 1).Tag = .mnuFileMRU(i).Tag              'holds the filespec
      .mnuFileMRU(i + 1).Visible = True
    Else
      .mnuFileMRU(i + 1).Visible = False
    End If
  Next i

  .mnuFileMRU(1).Tag = sFileSpec
  .mnuFileMRU(1).Caption = sFileName
  .mnuFileMRU(1).Visible = True
  .mnuFileBar6.Visible = True

  End With

End Sub
```

```
Public Function GetFileNameFromSpec(ByVal sFileSpec As String, sFileName As String) As Integer
  'Strip the filename and extention from the filespec (drive\path\filename)
  Dim r As Integer
  ReDim sList(50) As String
  On Error GoTo GetFileNameFromSpec_Error

  If Len(sFileSpec) > 0 Then
    r = ParseDelimString(sFileSpec, "\", sList())      'delimit all subpaths
    sFileName = LCase$(sList(r))                  'file name is last item in list

    'something was returned
    If Len(sFileName) > 0 Then GetFileNameFromSpec = True        'return success to caller
  End If


GetFileNameFromSpec_Exit:
  Exit Function

GetFileNameFromSpec_Error:
'"Resume 0
  Resume GetFileNameFromSpec_Exit

End Function
```

General.bas - ParseDelimString


```
Public Function ParseDelimString(ByVal sParse As String, ByVal sDelim As String, sFieldStrings() As String) A
  'Parse "sParse" passed here.  Put resulting parsed names in a list called sFieldStrings.
  'Use sDelim as the delimiter to parse string.
  'Trim any leading and trailing spaces from each field.
  'sFieldString list must pre-exist before calling here, and should be big enough to
  'hold all delimited strings.
  'The list contains fields in the order they appeared from left to right.
  'Function returns number of fields found.

  Dim i As Integer                    'loop counter
  Dim iDelim1 As Integer, iDelim2 As Integer      'marks beginning and end of a field

  If Len(sParse) = 0 Then Exit Function          'exit if no chars in string
    iDelim1 = 0                       'set first delim marker to beginning of line
  If Right$(sParse, Len(sDelim)) <> sDelim Then      'see if a delim is already at the end of the string
    sParse = sParse + sDelim                'put a delim at end of line
  End If

  'Note: an Erase method can not be used as it redims the array to only a few elements
  For i = 0 To UBound(sFieldStrings)            'clear out old data from the array
    sFieldStrings(i) = ""
  Next i

  i = 0
  Do While iDelim1 < Len(sParse)              'keep looking til all delims are found
    iDelim2 = InStr(iDelim1 + 1, sParse, sDelim)     'look for delim in string
    'get field from string, trim off spaces and put field into list
    sFieldStrings(i + 1) = Trim$(Mid$(sParse, iDelim1 + 1, iDelim2 - iDelim1 - 1))
    iDelim1 = iDelim2                   'reset first delim marker to lastest one found
    i = i + 1                     'increment field counter
  Loop                          'repeat search
  ParseDelimString = i                  'put parsed items count in element 0 of list

End Function
```

```
Public Function SaveDataToNewFile() As Integer
  'Get a filename from the common dialog
  'Setup the common dialog control prior to showing it

  On Error GoTo SaveDataToNewFile_Error
  With frmMain.dlgCommonDialog
    .Flags = cdlOFNOverwritePrompt Or cdlOFNCreatePrompt Or cdlOFNPathMustExist Or cdlOFNExplorer Or cdlOFNExtensionDifferent
     Or cdlOFNNoReadOnlyReturn Or cdlOFNHideReadOnly
    .CancelError = True          'generate error if CANCEL button is pressed
    .InitDir = App.Path + "\Patient Data"
    .Filter = "CycloTech Data File          *.cpd|*.cpd"
    .DialogTitle = "Save Patient Data As..."
    .DefaultExt = "CPD"       'append "Structure" extention when saving.
    If PAT_DATA.sPatientDataFileName = "" Then
      .filename = PAT_DATA.sPatientLastName + " " + PAT_DATA.sPatientFirstName + "  " + PAT_DATA.sPatientID + ".cpd"          'set a
       default file name
    Else
      .filename = PAT_DATA.sPatientDataFileName
    End If
    .ShowSave      'save as dialog
  End With

  PAT_DATA.sPatientDataFileName = frmMain.dlgCommonDialog.filename
  SavePatientData PAT_DATA.sPatientDataFileName
  SaveDataToNewFile = True

SaveDataToNewFile_Exit:
  Exit Function

SaveDataToNewFile_Error:
```

General.bas - SaveDataToNewFile


```
    If Err = cdlCancel Then                    'cancel button was pressed in dialog
        SaveDataToNewFile = vbCancel
        Resume SaveDataToNewFile_Exit
    End If
    SaveDataToNewFile = False

End Function
```

```
Public Function SavePatientData(ByVal sFileSpec As String) As Integer
    'Save all of the patient data currently in memory to a disk file
    'Return a true if save was successful, false if not, and vbCancel if user cancelled

    Dim sTemp As String, r As Integer, i As Integer, sSection As String
    Dim lCheckSumTally As Long

    On Error GoTo SavePatientData_Error

    ' r = GetFileNameFromSpec(frmMain.dlgCommonDialog.filename, sTemp)   'save the dir was selected by user
        . .
    'We need to confirm with user that it is desired to save these file modifications under the same
    'name as the one that was just loaded.
    '   If Len(frmMain.dlgCommonDialog.filename) And frmMain.dlgCommonDialog.filename = UCase$(Proj.sStructFileName) Then
    '    MSG$ = "You are about to save changes to the same file they were loaded from!"
    '    MSG$ = MSG$ + " Are you sure you want to do this?"
    '    Beep
    '    r = MsgBox(MSG$, MB_YES_NO, "Confirm Over Write")
    '    If r = ID_NO Then Exit Function                'oops, user almost made mistake, exit sub
    '   End If


    'Now save the data to the file
    'r = GetFileNameFromSpec(sTemp, sFileSpec)        'hold the name of the file
    'sFileSpec = App.Path & "\Patient Data"

    frmMain.MousePointer = vbHourglass
    DoEvents

    sSection = "Device Data"
    SaveINISetting sFileSpec, sSection, "Date Saved To File", Now
    SaveINISetting sFileSpec, sSection, "Host Software Version", CStr(App.Major & "." & App.Minor & "." & App.Revision)
    SaveINISetting sFileSpec, sSection, "Firmware Version", PAT_DATA.sFirmwareVer
    SaveINISetting sFileSpec, sSection, "Last Download Date", CDate(PAT_DATA.dLastDownloadDate)          'short date must be used to prevent
    error when loading back
    SaveINISetting sFileSpec, sSection, "Device Init Date", CDate(PAT_DATA.lDeviceInitDate)
    SaveINISetting sFileSpec, sSection, "Events Ref Date Time", CDate(PAT_DATA.dDeviceRefDateTime)
    SaveINISetting sFileSpec, sSection, "Last Name", PAT_DATA.sPatientLastName
    SaveINISetting sFileSpec, sSection, "First Name", PAT_DATA.sPatientFirstName
    SaveINISetting sFileSpec, sSection, "Serial Number", PAT_DATA.sSerialNumber
    SaveINISetting sFileSpec, sSection, "Patient ID", PAT_DATA.sPatientID
    SaveINISetting sFileSpec, sSection, "Organ", PAT_DATA.sOrgan
    SaveINISetting sFileSpec, sSection, "Organ Reference Number", CStr(GetOrganRefNumber())
    SaveINISetting sFileSpec, sSection, "Tx Center", PAT_DATA.sTxCenter
    SaveINISetting sFileSpec, sSection, "Drug", PAT_DATA.sDrug
    SaveINISetting sFileSpec, sSection, "Drug Reference Number", CStr(GetDrugRefNumber())
    SaveINISetting sFileSpec, sSection, "Dose Size", PAT_DATA.sDoseSize
    SaveINISetting sFileSpec, sSection, "Doses Per Day", CStr(PAT_DATA.iDosesPerDay)
    SaveINISetting sFileSpec, sSection, "Dose Resolution", PAT_DATA.sDoseResolution
    SaveINISetting sFileSpec, sSection, "Medication Remaining", PAT_DATA.sMedRemaining
    SaveINISetting sFileSpec, sSection, "Battery Change Timer", PAT_DATA.sBatteryChangeTimer
    SaveINISetting sFileSpec, sSection, "Lockout Hours Between Doses", PAT_DATA.sDoseLockoutHours

    For i = 1 To 14
        SaveINISetting sFileSpec, sSection, "Patient Score Data " + CStr(i), PAT_DATA.sScoreData(i)
    Next i

    For i = 1 To giMaxDoseTimes
        If PAT_DATA.dPrescribedDoseTime(i) >= 0 Then
```

General.bas - SavePatientData

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```
            SaveINISetting sFileSpec, sSection, "Prescribed Dose Time " + CStr(i), Format$(PAT_DATA.dPrescribedDoseTime(i),
            gsTimeDisplayFormat)
        Else
            SaveINISetting sFileSpec, sSection, "Prescribed Dose Time " + CStr(i), " None"
        End If
    Next i


    'This section is finished.  Go compute the checksum and save it.
    lCheckSumTally = ComputeIniSectionChecksum(sFileSpec, sSection)
    SaveINISetting sFileSpec, "General", "Device Data Validation", CStr(lCheckSumTally)


    'Before saving new event data, clear out the old strings
    sSection = "Event Data"
    r = WritePrivateProfileString(sSection, ByVal 0&, ByVal 0&, sFileSpec)
    SaveINISetting sFileSpec, sSection, "Event Count", CStr(PAT_DATA.iEventData(0))
    For i = 1 To PAT_DATA.iEventData(0)        'total number of events
        sTemp = Format$(PAT_DATA.dEventDate(i), "General Date") + ",  "
        Select Case PAT_DATA.byteEventType(i)
            Case giEVENT_DOSE_TAKEN
                sTemp = sTemp + "Dose Taken, "

            Case giEVENT_DOSE_CHANGED
                sTemp = sTemp + "Dose Change,  "

            Case giEVENT_USER_DEFINED
                sTemp = sTemp + "Custom Event,  "
        End Select

        sTemp = sTemp + CStr(PAT_DATA.iEventData(i))
        sTemp = sTemp + " ," + PAT_DATA.sUserData1(i)
        sTemp = sTemp + " ," + PAT_DATA.sUserData2(i)
        sTemp = sTemp + " ," + PAT_DATA.sUserData3(i)
        SaveINISetting sFileSpec, sSection, CStr(i), sTemp
    Next i

    'This section is finished.  Go compute the checksum and save it.
    lCheckSumTally = ComputeIniSectionChecksum(sFileSpec, sSection)
    SaveINISetting sFileSpec, "General", "Event Data Validation", CStr(lCheckSumTally)


    sSection = "Device Error Flags"
    SaveINISetting sFileSpec, sSection, "Fatal", CStr(PAT_DATA.bErrorFatal)
    SaveINISetting sFileSpec, sSection, "Non Fatal", CStr(PAT_DATA.bErrorNonFatal)
    SaveINISetting sFileSpec, sSection, "Dose Size", CStr(PAT_DATA.bErrorDoseSize)
    SaveINISetting sFileSpec, sSection, "Med Remaining", CStr(PAT_DATA.bErrorMedRemaining)
    SaveINISetting sFileSpec, sSection, "Memory Full", CStr(PAT_DATA.bErrorMemoryFull)
    SaveINISetting sFileSpec, sSection, "Brownout", CStr(PAT_DATA.bErrorBrownOut)

    'This section is finished.  Go compute the checksum and save it.
    lCheckSumTally = ComputeIniSectionChecksum(sFileSpec, sSection)
    SaveINISetting sFileSpec, "General", "Device Error Flags Validation", CStr(lCheckSumTally)


    gbPatientDataNotSaved = False
    r = GetFileNameFromSpec(sFileSpec, PAT_DATA.sPatientDataFileName)        'hold the name of the file
    UpDateRecentFileMenu sFileSpec
    frmMain.mnuFileSave.Enabled = True
    SavePatientData = True


SavePatientData_Exit:
    On Error GoTo 0
    frmMain.MousePointer = vbDefault
    Exit Function

SavePatientData_Error:
    SavePatientData = False
```

General.bas - SavePatientData

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```
    Resume SavePatientData_Exit     'exit anyway for now
End Function

Public Sub PopulateDeviceCommDialog(DataStruct As DeviceDataStruct, SourceForm As Form)
    'There are two possible dialogs that have the same controls on them.
    'This common procedure will populate both
    On Error Resume Next        'not all text boxes will appear on every form
    Dim i As Integer

    With SourceForm
      'Show custom labels from config file if there were any
      .Label1(3) = gsCustomLblPatientLastName
      .Label1(1) = gsCustomLblPatientFirstName
      .Label1(5) = gsCustomLblPatientID
      .Label1(6) = gsCustomLblTxCenter
      .Label1(7) = gsCustomLblDrug
      .Label1(0) = gsCustomLblOrgan
            . .

      If TypeOf .txtDrug Is SSPanel Then
         .txtDrug = DataStruct.sDrug
      ElseIf TypeOf .txtDrug Is ComboBox Then      'it is a list box
         .txtDrug.Clear
         For i = 1 To gsDrugNames(0)          'fill the drugs list box with available choices
            .txtDrug.AddItem gsDrugNames(i)
         Next i

         For i = 0 To .txtDrug.ListCount - 1
            If .txtDrug.List(i) = DataStruct.sDrug Then
               .txtDrug.ListIndex = i
               Exit For
            End If
         Next i

      End If

      If TypeOf .txtOrgan Is SSPanel Then
         .txtOrgan = DataStruct.sOrgan

      ElseIf TypeOf .txtOrgan Is ComboBox Then      'it is a list box
         .txtOrgan.Clear
         For i = 1 To gsOrganNames(0)          'fill the drugs list box with available choices
            .txtOrgan.AddItem gsOrganNames(i)
         Next i

         For i = 0 To .txtOrgan.ListCount - 1
            If .txtOrgan.List(i) = DataStruct.sOrgan Then
               .txtOrgan.ListIndex = i
               Exit For
            End If
         Next i

      End If

      .txtPatientLastName = DataStruct.sPatientLastName
      .txtPatientFirstName = DataStruct.sPatientFirstName
      .txtPatientID = DataStruct.sPatientID
      .txtTxCenter = DataStruct.sTxCenter
      .txtSerialNumber = DataStruct.sSerialNumber
      .txtDoseSize = " " + DataStruct.sDoseSize
```

General.bas - PopulateDeviceCommDia

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```
    If DataStruct.iEventData(0) Then
       .txtEventCount = " " + CStr(DataStruct.iEventData(0)) + " "
    Else
       .txtEventCount = ""
    End If

    If PAT_DATA.dLastDownloadDate Then
       .txtLastRetrievalDate = " " + Format$(CDate(DataStruct.dLastDownloadDate), "Short Date") + "  " + Format$(CDate(DataStruct.
       dLastDownloadDate), "Medium Time") + " "
    Else
       .txtLastRetrievalDate = ""
    End If

    .txtPatientLastName   'take focus away from list box after it was set

    For i = 1 To giMaxDoseTimes
       If DataStruct.dPrescribedDoseTime(i) >= 0 Then
          .txtDoseTime(i) = " " + Format$(DataStruct.dPrescribedDoseTime(i), gsTimeDisplayFormat) + " "
       End If
    Next i

    .txtDosesPerDay = " " + CStr(DataStruct.iDosesPerDay) + " "
    .txtDoseResolution = " " + DataStruct.sDoseResolution + " "
    .txtDoseLockoutHours = " " + DataStruct.sDoseLockoutHours + " "
    .txtMedicationRemaining = " " + DataStruct.sMedRemaining + " "
    If DataStruct.lDeviceInitDate Then
       .txtDeviceStarted = " " + Format$(CDate(DataStruct.lDeviceInitDate), "Medium Date")
    End If
    .txtBatteryChangeTimer = " " + DataStruct.sBatteryChangeTimer + " "

    'set indicators for error flags
    With DataStruct
       If .bErrorFatal Or .bErrorNonFatal Or .bErrorDoseSize Or .bErrorMedRemaining Or .bErrorMemoryFull Or .bErrorBrownOut Then
          SourceForm.imgErrorReceived.Visible = True        'errors were found
          SourceForm.lblErrorsReceived.Visible = True
       Else
          SourceForm.imgErrorsReceived.Visible = False      'no errors exist
          SourceForm.lblErrorsReceived.Visible = False
       End If
    End With

  End With
  On Error GoTo 0

End Sub
```

```
Public Sub SaveProgramPreferences()
  Dim i As Integer, sSection As String, sFileSpec As String
  sSection = "Preferences"
  SaveINISetting gsAppIniFileSpec, sSection, "Date Display Format", gsDateDisplayFormat
  SaveINISetting gsAppIniFileSpec, sSection, "Time Display Format", gsTimeDisplayFormat
  SaveINISetting gsAppIniFileSpec, sSection, "Compliance Time Range", CStr(gsngComplianceTimeRange)

  'Save the names of the most recently used files from the menu
  For i = 1 To frmMain.mnuFileMRU.UBound
     SaveINISetting gsAppIniFileSpec, "Recent Files", CStr(i), frmMain.mnuFileMRU(i).Caption
  Next i

  SaveINISetting gsAppIniFileSpec, "Options", "Current Tip", CStr(giCurrentTip)


  'Save Settings of Calendar Form
  SaveINISetting gsAppIniFileSpec, "Calendar Settings", "chkDosesMissed", CStr(CAL_DEFAULTS.chkDosesMissed)
  SaveINISetting gsAppIniFileSpec, "Calendar Settings", "chkDosesNotComplied", CStr(CAL_DEFAULTS.chkDosesNotComplied)
  SaveINISetting gsAppIniFileSpec, "Calendar Settings", "chkDosesTaken", CStr(CAL_DEFAULTS.chkDosesTaken)
  SaveINISetting gsAppIniFileSpec, "Calendar Settings", "chkDoseChanged", CStr(CAL_DEFAULTS.chkDoseChanged)
```

General.bas - SaveProgramPreferenc

```
    'Save Settings of Patient Summary Form
    SaveINISetting gsAppIniFileSpec, "Patient Summary Settings", "cmboDataToView", CStr(PAT_SUM_DEFAULTS.cmboDataToView)
    SaveINISetting gsAppIniFileSpec, "Patient Summary Settings", "cmboChartType", CStr(PAT_SUM_DEFAULTS.cmboChartType)
End Sub

Public Function FindFirstMatchingDateInArray(DataStruct As DeviceDataStruct, ByVal lBeginDate As Long)
    'Find the earliest event date in the global structure that starts on the same day
    'as the date passed here.  Return 0 if not found or return the index to the date
    'if one is found.
    'Note that this date is not necessarily a dosing event date.  It could be any kind of event

    'Conduct a successive approximation lookup of the date in the array
    Dim i As Integer, iLowIndex As Integer, iHighIndex As Integer, iTestIndex As Integer

    iLowIndex = 1                       'start at being of array
    iHighIndex = DataStruct.iEventData(0)       'stop at end of array
    iTestIndex = (iHighIndex + iLowIndex) / 2
    For i = 1 To 7      'this number of tmes is all that is necessary to find the date
        If lBeginDate < Int(DataStruct.dEventDate(iTestIndex)) Then
            iHighIndex = iTestIndex

        ElseIf lBeginDate > Int(DataStruct.dEventDate(iTestIndex)) Then
            iLowIndex = iTestIndex

        ElseIf lBeginDate = Int(DataStruct.dEventDate(iTestIndex)) Then
            lHighIndex = iTestIndex
            FindFirstMatchingDateInArray = iTestIndex

        End If
        iTestIndex = (iHighIndex + iLowIndex + 0.5) / 2
    Next i

End Function

Public Function FindClosestDateInArray(DataStruct As DeviceDataStruct, ByVal lFromDate As Long) As Long
    'Find the latest event date in the global structure that starts on the same day
    'as the date passed here.  Return 0 if not found or return the index to the date
    'if one is found.
    'If a 0 value is passed here then find the most recent date in the array.
    'Note that this date is not necessarily a dosing event date.  There is a separate
    'procedure to find that date.

    'rgh if necessary for faster speed. this procedure can be recoded to do a successive approximation

    Dim i As Integer
    If lFromDate = 0 Then lFromDate = 99999
    For i = 1 To DataStruct.iEventData(0)       'find the latest date in the array
        If lFromDate <= Int(DataStruct.dEventDate(i)) Then
            FindClosestDateInArray = i
            Exit For
        End If
    Next i

End Function
```

General.bas - SaveINISetting


```
Public Sub SaveINISetting(ByVal sFileName As String, ByVal sSection As String, ByVal sKeyField As String, s
  Dim l As Long

  l = WritePrivateProfileString(sSection, sKeyField, sValue, sFileName)

End Sub
```

```
Public Function ValidateDoseNumbers(frmTarget As Form)
  'Ensure that there are at least as many dose times as there are
  'for the number of doses per day.

  Dim i As Integer, iDailyDoseCounts As Integer, iDosesPerDay As Integer
  If Len(PAT_DATA.sPatientDataFileName) = 0 And Len(PAT_DATA.sSerialNumber) = 0 Then
    ValidateDoseNumbers = True
    Exit Function
  End If

  With frmTarget
    iDosesPerDay = Val(.txtDosesPerDay)

    For i = 1 To 4
      If IsDate(.txtDoseTime(i)) Then
        iDailyDoseCounts = iDailyDoseCounts + 1
      End If
    Next i

    If iDailyDoseCounts = iDosesPerDay Then
      ValidateDoseNumbers = True

    Else
      Beep
      MsgBox "You have indicated " + CStr(iDosesPerDay) + " Doses Per Day, yet " + CStr(iDailyDoseCounts) + " Dose Times were
      entered.  They must match.", vbExclamation, "Mis-matched Dosing Values"
      .txtDosesPerDay.SetFocus
      'UpDownDoseTime(4).SetFocus
    End If

  End With

End Function
```

```
Public Function ValidatePatientDataSaved()
  'Ensure that the patient data in memory is saved before proceeding to load new data from device
  'Return true if successful, else return vbCancel if usr cancelled

  Dim r As Integer

  ValidatePatientDataSaved = True     'this is the default condition unless set otherwise below
  If gbPatientDataNotSaved Then
    Beep
    r = MsgBox("The patient data currently in memory has not been saved.  Do you want to save it?", vbYesNoCancel + vbQuestion, "
    Patient Data Not Saved")
    If r = vbYes Then
      r = SaveDataToNewFile()
      If r = vbCancel Then ValidatePatientDataSaved = vbCancel     'cancelled from the save as dialog

    ElseIf r = vbCancel Then
      ValidatePatientDataSaved = vbCancel          'cancelled from message box

    End If

  End If
```

General.bas - ValidatePatientDataSaved

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```
End Function

Public Sub Wait(ByVal dSeconds As Double)
    'wait for the specified time passed here. then return to caller.
    Dim dDelay As Double

    dDelay = DateAdd("s", dSeconds, CDbl(Now))
    dDelay = CDbl(Now) + (dSeconds / 86400)      '86400 seconds in a day

    Do
        DoEvents
        DoEvents
    Loop While (dDelay >= CDbl(Now))

End Sub
```

Comm.bas - File Declarations


```
Attribute VB_Name = "modComm"
  Option Explicit
  'Global definitions for device communication.
  'by Glen Hamilton  10/5/97

  ' for RS232 communication
  Public gbCommTimerExpired As Integer          'this flag is set when the comm timer expires
  Public giCommPort As Integer                  'Communication Port #
  Public gsCommDeviceSettings As String         'speed settings (ie 2400,N,8,2)
  Public gbCommReplyPending As Boolean          'a command was just sent, and reply is pending
  Public gbCommBusy As Boolean                  'a command is in progress.  Get's cleared when reply is received or times out
  Public gbCommOK As Integer                    'needs to be an integer (no boolean) keeps current status of communications.  false= no
  comm, true = comm ok, any other value for simulation
  Public giDeviceResponseWait As Integer        'millisecs to wait for next char before assuming end of received string
  Private Const ERR_COMM_BADRESPONSE = 31001
  Private Const ERR_COMM_TIMEOUT = 30998
  'Private Const ERR_COMM_STRINGLENGTH = 30997
  'Private Const ERR_COMM_BUSY = 30996
  Private Const ERR_COMM_CHECKSUM = 30995

  Public Const ERR_DATA_CHECKSUM = 99997
  Public Const ERR_NEWER_HOST_SOFTWARE = 99998    'set when device returns custom data that was saved with a newer revision
  level


  'Device communications
  Public gbKeepPollingDevice As Boolean         'when true, continuous polling of device is done

  'Define some application specific variables & constants
  Public gsAppIniFileSpec  As String

  Type DeviceDataStruct
    sPatientLastName As String      '(16 bytes) uses 1st 16 byte block of the patient/pharmacy ID & Names
    sPatientFirstName As String     '(16 bytes) uses 1st 16 byte block of the patient/pharmacy ID & Names
    sPatientID As String
    sDrug As String             '(16 bytes) uses 2nd 16 byte block of the patient/pharmacy ID & Names
    sOrgan As String            '(16 bytes) uses 3nd 16 byte block of the patient/pharmacy ID & Names
    sTxCenter As String         '(16 bytes) uses 3nd 16 byte block of the patient/pharmacy ID & Names
    sSerialNumber As String     '(10 bytes) device serial number
    sFirmwareVer As String      'Rev version and date of firmware
    sDoseSize As String         '(1 byte) stored here in mg.  The device uses "ml" (100mg = 1 ml)
                    'Device Dose size is in optical ticks (0 to 200) max dose = 5 ml.

    sPatientDataFileName As String  'file path and filename of the data in memory

    'Note: the daily prescribed dosing times below are stored in fractional days.  This is done
    'to speed display operations and reduce the amount of memory needed.  The device actually stores
    'these values as intervals relative to 1:00 in the morning.  Thus, the times are converted to
    'intervals when communicating with the device.
    dPrescribedDoseTime(4) As Double    'doses due during the day  (prescribed)  usually a max of four
    iDosesPerDay As Integer         '(1 byte) # of doses per day (1 to 4)
    sDoseResolution As String       '(1 byte) Called "Dose Conversion" in firmware.
          'Optical ticks to mg multiplier.  (IE 2 ticks = 10 mg.)
          'Optical ticks are fixed at 0.05 ml per tick.
    sMedRemaining As String         '(2 bytes) Medication "Supply volume" remaining (in optical ticks)
    sScoreData(14) As String        'Today's score(14 bytes for all scores) of last 14 days doses taken.  Circular buffer.
          'valid data is value from 0-4 representing number of doses taken each day.
          'Note:  The "Score pointer" points to the current day.

    'Note that the following arrays can not be larger than 1500 events or else the space limit
    'of 64K will be exceeded.  If necessary in the future to have more events than this for
    'a single file then make a separate array for the diagnostic data or temp data.
    iEventData(1400) As Integer     'the data occurring for the event data. Might be a dose size, error flags, etc.
    dEventDate(1400) As Double      'list of dose days in order of first taken to most recent
    byteEventType(1400) As Byte     'value =0 if it is a dose taken
                    'value = 1 if data event is a dose command change
                    'value = 2 if user entered entered
    sUserData1(1400) As String      'user entered data in the first column of the grid
    sUserData2(1400) As String      'user entered data in the first column of the grid
```

Comm.bas - File Declarations


```
    sUserData3(1400) As String      'user entered data in the first column of the grid

    sClock As String            '(2 bytes)10 minute resolution "0000" = 1 am on first dose day.
    lDeviceInitDate As Long     'date the device started
    dDeviceRefDateTime As Double    'date and time that all events are referenced to.
    sBatteryChangeTimer As String   '(2 bytes)Battery change timer, in 10 minute increments
    sDoseLockoutHours As String     '(1 byte) Hours to lockout dosing after a dose is taken
    bErrorFatal As Boolean      'true if this flag was set in the returned flags string
    bErrorNonFatal As Boolean       'true if this flag was set in the returned flags string
    bErrorDoseSize As Boolean       'true if this flag was set in the returned flags string
    bErrorMedRemaining As Boolean   'true if this flag was set in the returned flags string
    bErrorMemoryFull As Boolean     'true if this flag was set in the returned flags string
    bErrorBrownOut As Boolean       'true if this flag was set in the returned flags string
    bErrorsExist As Boolean     '(1 byte) Bits are set if various errors have occurred and have not
            'been corrected.  A value of "0" is normal (no errors).  Errors
            'are corrected by either correcting the specific situation or
            'resetting & reloading the dosing parameters.
            'B0=1 if fatal system failure
            'B1=1 if non-fatal system failure has occurred
            'B2=1 if error has occurred in Dose Size Volume
            'B3=1 if error has occurred in Supply Volume value
            'B4=1 if compliance memory is near full
            'B5=1 if brownout (low voltage) occurred

    dLastDownloadDate As Double     'date of last data retrieval from device

End Type
Public PAT_DATA As DeviceDataStruct
Public TEMP_DATA As DeviceDataStruct

Public gsDrugNames(25) As String    'names of drugs used to populate the list boxes on dialogs
Public gsOrganNames(25) As String   'names of gsOrganNames used to populate the list boxes on dialogs

Public Const giEVENT_DOSE_TAKEN = 0
Public Const giEVENT_DOSE_CHANGED = 1
Public Const giEVENT_USER_DEFINED = 2


'These values indicate the string position (returned from the device) where each element
'begins.  This is the string that is returned when a request for "all memory" is sent.
'See above structures for more detail information about format.
Public Const DATA_BEGIN_DOSE_SIZE = 1                   '1 byte
Public Const DATA_BEGIN_DOSE_INTERVAL1 = 1 * 2 + 1      '1 byte
Public Const DATA_BEGIN_DOSE_INTERVAL2 = 2 * 2 + 1      '1 byte
Public Const DATA_BEGIN_DOSE_INTERVAL3 = 3 * 2 + 1      '1 byte
Public Const DATA_BEGIN_DOSE_INTERVAL4 = 4 * 2 + 1      '1 byte
Public Const DATA_BEGIN_DOSES_PER_DAY = 5 * 2 + 1       '1 byte
Public Const DATA_BEGIN_DOSE_CONVERSION = 6 * 2 + 1     '1 byte
Public Const DATA_BEGIN_DOSE_LOCKOUT_HOURS = 7 * 2 + 1  '1 byte
Public Const DATA_BEGIN_DOSE_SCORE_DAY_POINTER = 8 * 2 + 1  '1 byte
Public Const DATA_BEGIN_MED_REMAINING = 9 * 2 + 1       '2 bytes
Public Const DATA_BEGIN_CLOCK = 11 * 2 + 1              '2 bytes clock starts at 1am on first dosing day (10 min increments)
Public Const DATA_BEGIN_BATTERY_CHANGE_TIMER = 13 * 2 + 1   '2 bytes
Public Const DATA_BEGIN_ERROR_FLAGS = 15 * 2 + 1        '1 byte
Public Const DATA_BEGIN_PREV_DOSE_PARAMS = 16 * 2 + 1   '16 bytes of copy of prev dosing params
            '(used for error checking internal to dispenser)
Public Const DATA_BEGIN_KEY_BITS = 32 * 2 + 1           'activation of keys on device
Public Const DATA_BEGIN_LIFE_COUNT = 33 * 2 + 1         'LSB in 33, MSB in 34
Public Const DATA_BEGIN_LIFE_COMPLETION = 35 * 2 + 1    '=0 when life cycle is programmed, =1 when life test completes
 successfully
Public Const DATA_BEGIN_COMPENSATION_FACTOR = 36 * 2 + 1    'values from 64-192 (128= 1.0 factor)
Public Const DATA_BEGIN_SERIAL_NUMBER = 38 * 2 + 1      '10 bytes
Public Const DATA_BEGIN_CUSTOM1 = 48 * 2 + 1            '16 bytes of patient/pharamcy ID & names
Public Const DATA_BEGIN_CUSTOM2 = 64 * 2 + 1            '16 bytes of patient/pharamcy ID & names
Public Const DATA_BEGIN_CUSTOM3 = 80 * 2 + 1            '16 bytes of patient/pharamcy ID & names
Public Const DATA_BEGIN_CUSTOM4 = 96 * 2 + 1            '16 bytes of patient/pharamcy ID & names
Public Const DATA_BEGIN_SCORE = 112 * 2 + 1             '14 bytes
Public Const DATA_BEGIN_COMPLIANCE_CHECKSUM = 128 * 2 + 1   '2 bytes Includes compliance pointer and data
            '(up to data word 1 before data pointed to by comp pointer
```

Comm.bas - File Declarations

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```
Public Const DATA_BEGIN_COMPLIANCE_POINTER = 130 * 2 + 1        '2 bytes  points to nect location after end of current compliance
data
                'base value = 132 (0x0084)
Public Const DATA_BEGIN_COMPLIANCE_DATA = 132 * 2 + 1           '~1900 bytes max.  Array of 2 byte values for dose compliance
history.
                'Clock time values (in 10 minutes resolution from start) when each dose
                'was taken.  Represented by values 0-65279 (0-0xfeff).  Each dose time
                'is changed via the "Set Mode", a value between 0xff00 and 0xffc8 is written
                'with the LSD byte representing the dose size.  When compliance memory is
                'cleared, the current dose size is always written as the first location in
                'the compliance memory
```

```
Public Sub ChangeBatteriesRequest()
  Dim r As Integer, lErrorCode As Long, sMSG As String

  sMSG = "You should continue only if you are replacing the batteries in the device."
  sMSG = sMSG + "  This ensures that the battery time counter will be accurate." + vbCrLf + vbCrLf
  sMSG = sMSG + " Did you just replace the batteries or are you about to change them now?"
  r = MsgBox(sMSG, vbQuestion + vbYesNo + vbDefaultButton2, "Change Batteries")

  If r = vbNo Then Exit Sub

  gbKeepPollingDevice = False           'stop polling for now
  Wait 0.25

  On Error GoTo ChangeBatteriesRequest_Error

  r = Comm_SendResetClockAndBattery(lErrorCode)
  If lErrorCode Then
    Error lErrorCode        'error number
  Else
    sMSG = "Replace the device batteries now and retrieve data from the device again when complete."
    r = MsgBox(sMSG, vbExclamation, "Change Batteries")
  End If

ChangeBatteriesRequest_Exit:
  gbKeepPollingDevice = True        'continue polling device
  Exit Sub

ChangeBatteriesRequest_Error:
  DisplayErrorMessage lErrorCode
  Resume ChangeBatteriesRequest_Exit

End Sub
```

```
Public Function Comm_CheckComm(lErrorCode As Long) As Integer
  'Check the device communication by sending a command and waiting for a reply.
  'If no reply is received, then return a "false" flag to caller.

  'Important Note: Due to the way the firmware was designed for the device, it seems not
  'to return anything if the command is in error.  This is not good because
  'we would not know whether or not a failed reply is due to a back cable, incorrect comm port
  'or settings, etc.  Hopefully in a future version, the comm check can return some sort of
  'character to indicate that a common byte was received, but could not be interpreted correctly.

  Dim sOut As String, sChecksum As String, sIn As String

  sOut = "Pp"                   'this is the code for checking communication with device
  CreateChecksum sOut, sChecksum        'calculate a checksum
  sOut = sOut + sChecksum + "!"         'append checksum and ending string identifier

  If Not frmMain.CommDevice.PortOpen Then frmMain.CommDevice.PortOpen = True

  gbCommBusy = True             'prevent other procedures from communicating with device
  frmMain.CommDevice.InputLen = 0       'clear input buffer
```

Comm.bas - Comm_CheckComm


```
    frmMain.CommDevice.Output = sOut          'send string to device
    gbCommReplyPending = True                 'prevent other procedures from communicating with device
    SetCommTimer giDeviceResponseWait         'set timer to wait for response

    lErrorCode = 0                            'reset error code
    Do
      If gbCommTimerExpired Then              'timer event sets this to true
        lErrorCode = ERR_COMM_TIMEOUT         'no response, get the error code
        GoTo Comm_CheckComm_Exit              'return to calling procedure
      End If
      DoEvents
    Loop Until frmMain.CommDevice.InBufferCount > 0     'loop till a reply is received or timeout occurs

    sIn = frmMain.CommDevice.Input            'Read response from serial port
    'comm is ok
    If sIn = "$" Then Comm_CheckComm = True   'return success to caller

Comm_CheckComm_Exit:
    If frmMain.CommDevice.PortOpen Then frmMain.CommDevice.PortOpen = False    ' Close the serial port
    gbCommReplyPending = False                'reset flag
    gbCommBusy = False                        'reset flag

End Function
```

```
Public Function Comm_GetDeviceReply(sReply As String, lErrorCode As Long) As Integer
    'A command should have been just sent to the device from another procedure and a reply is pending
    'Get the reply into 'sReply' and return to caller.
    'Return false if no reply and set lErrorCode to reason.
    'Return ERR_COMM_TIMEOUT if no reply from the device.
    'error code = 0 if comm is already busy.
    'If reply, then return number of characters received.
    'Close comm port once a reply is received or if an error occurs.

    Dim iLastBufferCount As Integer, r As Integer

    On Error GoTo Comm_GetDeviceReply_Error
    gbCommReplyPending = True                 'set busy flag
    frmMain.MousePointer = vbHourglass

    'Open comm port in case it is closed
    'prevent device unavailable error
    If frmMain.CommDevice.PortOpen = False Then frmMain.CommDevice.PortOpen = True    'open port
    sReply = ""                               'init reply

    'Wait for first char to arrive
    SetCommTimer giDeviceResponseWait         '20 milliseconds is normally sufficient
    Do Until frmMain.CommDevice.InBufferCount > 0
      DoEvents
      'timer event sets this to true
      If gbCommTimerExpired Then Error ERR_COMM_TIMEOUT     'return message to caller. No response
    Loop

    'First char has been received
    'Wait for all data to arrive
    iLastBufferCount = -1                     'init buffer count
    Do While frmMain.CommDevice.InBufferCount > iLastBufferCount     'characters are still arriving
      iLastBufferCount = frmMain.CommDevice.InBufferCount     'remember intermediate count
      SetCommTimer giDeviceResponseWait       'this value works as low as 25 milliseconds
      Do Until gbCommTimerExpired = True      'wait for timer to expire
        DoEvents
        DoEvents
      Loop
    Loop                                      'loop if characters are still coming in

    'All data has arrived or time has been too long
```

Comm.bas - Comm_GetDeviceReply

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```
    r = frmMain.CommDevice.InBufferCount          'get character length
    sReply = frmMain.CommDevice.Input             'read string from buffer
    Comm_GetDeviceReply = Len(sReply)             'return buffer length to caller (- checksum)


Comm_GetDeviceReply_Exit:
    'prevent device unavailable error
    If frmMain.CommDevice.PortOpen = True Then frmMain.CommDevice.PortOpen = False      'close port if open
    frmMain.MousePointer = vbDefault
    On Error GoTo 0                               'clear error status
    gbCommReplyPending = False                    'reset pending flag
    gbCommBusy = False                            'reset busy flag
    Exit Function


Comm_GetDeviceReply_Error:
    lErrorCode = Err                              'return error code to caller
    '"Resume 0   'for testing only
    Resume Comm_GetDeviceReply_Exit
End Function
```

Public Function Comm_ReadFirmwareVersion(DataStruct As DeviceDataStruct, lReturnError As Long) As Integ

```
    Dim sOut As String, sChecksum As String, sIn As String, lErrorCode As Long, r As String

    sOut = "Vv"                                   'this is the code for version number
    CreateChecksum sOut, sChecksum                'calculate a checksum
    sOut = sOut + sChecksum + "|"                 'append checksum and ending string identifier

    If Not frmMain.CommDevice.PortOpen Then frmMain.CommDevice.PortOpen = True

    frmMain.CommDevice.InputLen = 0               'clear input buffer
    frmMain.CommDevice.Output = sOut              'send string to device
    r = Comm_GetDeviceReply(sIn, lErrorCode)

    If lErrorCode = 0 Then                        'comm was received
        r = ValidateChecksum(sIn)
        If r Then
            DataStruct.sFirmwareVer = Left$(sIn, Len(sIn) - 5)      'put string in global array
            Comm_ReadFirmwareVersion = True       'return success to caller
        End If

    Else
        lReturnError = lErrorCode
'       DisplayErrorMessage lErrorCode
    End If
End Function
```

Public Sub DisplayCommError(SourceForm As Form)

```
    gbCommOK = False
    SourceForm.ImgCommStatus.Picture = SourceForm.imgRedLight
    SourceForm.lblCommStatus = "No Device Found"

    'Play disconnect sound and show status visually
    'Set properties needed by MCI to open
    With SourceForm.MMControl1
        .Notify = False
        .Wait = False
        .Shareable = False
        .filename = App.Path + "\ProbDetectVoice.wav"

        'Open the MCI WaveAudio device
        .Command = "Open"
        .Command = "sound"
        .Command = "close"
    End With
```

```
End Sub

Public Sub DisplayCommOk(SourceForm As Form)
    'Play connect sound and show status visually
    'Set properties needed by MCI to open
    gbCommOK = True
    With SourceForm.MMControl1
        .Notify = False
        .Wait = False
        .Shareable = False
        .filename = App.Path + "\morsecode.wav"

        'Open the MCI WaveAudio device
        .Command = "Open"
        .Command = "sound"
        .Command = "sound"
        .Command = "close"
    End With

    SourceForm.imgCommStatus.Picture = SourceForm.imgGreenLight
    SourceForm.lblCommStatus = "Device Ready"

End Sub

Public Sub DisplayErrorMessage(lErrorCode As Long)
    Dim sMSG As String

    Select Case lErrorCode

        Case ERR_COMM_TIMEOUT
            sMSG = "No response was received from the device to the command just issued.  Remove the device from the communicator and
↳           re-insert it to ensure that it is seated properly."

        Case ERR_COMM_CHECKSUM
            sMSG = "Data retrieved from the device is corrupted.  This probably occurred during transmission.  Please read the device again."

        Case ERR_COMM_BADRESPONSE
            sMSG = "The device did not interpret the command properly."

        Case ERR_NEWER_HOST_SOFTWARE
            sMSG = "The device was previously programmed with a newer version of this software.  The data can not be retrieved." + vbCrLf +
↳           vbCrLf + "Please obtain an updated version this software."

        Case Else
            sMSG = "An error was detected while communicating with the device.  Please try again." + vbCrLf + vbCrLf + Error$(lErrorCode)

    End Select

    MsgBox sMSG, , App.ProductName + " Comm Error - " + CStr(lErrorCode)

End Sub
```

Comm.bas - GetDrugRefNumber


```
Public Function GetDrugRefNumber() As Integer
  'Find the index to the organ name being using in the global structure

  Dim i As Integer

  For i = 1 To UBound(gsDrugNames)
    If LCase(PAT_DATA.sDrug) = LCase(gsDrugNames(i)) Then Exit For
  Next i

  GetDrugRefNumber = i        'return ref number to caller

End Function
```

```
Public Function GetOrganRefNumber() As Integer
  'Find the index to the organ name being using in the global structure

  Dim i As Integer

  For i = 1 To UBound(gsOrganNames)
    If LCase(PAT_DATA.sOrgan) = LCase(gsOrganNames(i)) Then Exit For
  Next i

  GetOrganRefNumber = i        'return ref number to caller

End Function
```

```
Private Function InterpretDosingData(DataStruct As DeviceDataStruct, ByVal sData As String, ByVal
dCheckSumTally As Double, ByVal lCheckSum As Long, lErrorCode As Long) As Integer
  'Parse apart the dosing data that is passed here and put into global structure.
  'Each dosing event is 2 bytes in length.
  'The checksum is passed here for comparison to the string.
  'The checksum includes the pointer bytes which is why it is passed in.

  Dim sTemp As String, iLowByte As Integer, iHiByte As Integer, lCurrentDoseAmount As Long
  Dim r As Integer, iposition As Integer, iCount As Integer, lTemp As Long
  On Error GoTo InterpretDosingData_Error

  For iposition = 1 To Len(sData) Step 4     'there are 2 hex bytes to every dose event
    iCount = iCount + 1
    iLowByte = CInt("&H" + Mid$(sData, iposition, 2))        'get first of the 2 byte hex value
    dCheckSumTally = dCheckSumTally + iLowByte               'add to checksum
    iHiByte = CInt("&H" + Mid$(sData, iposition + 2, 2))     'get second of the 2 byte hex value
    dCheckSumTally = dCheckSumTally + iHiByte                'add to checksum
    If iHiByte = 255 Then                          'indicates a dose change
      DataStruct.byteEventType(iCount) = giEVENT_DOSE_CHANGED
      lCurrentDoseAmount = CLng(iLowByte) / 40 * 100        'convert from ml to mg; this is a new dose size change
      DataStruct.iEventData(iCount) = lCurrentDoseAmount
      DataStruct.dEventDate(iCount) = CLng(DataStruct.dEventDate(iCount - 1))       'get date from last dose
      'This is the very first dose change
      If DataStruct.dEventDate(iCount) = 0 Then
        DataStruct.dEventDate(iCount) = 1
      End If
    Else                                           'this is a dose
      DataStruct.byteEventType(iCount) = giEVENT_DOSE_TAKEN
      DataStruct.iEventData(iCount) = lCurrentDoseAmount      'convert from ml to mg; this is a new dose size change
      lTemp = CLng(iHiByte) * 256 + iLowByte     'date and time is 10 minute intervals since first dose day
      DataStruct.dEventDate(iCount) = DateAdd("n", lTemp * 10, DataStruct.dDeviceRefDateTime)
    End If
  Next iposition
  DataStruct.iEventData(0) = iCount        'put the total number of events in the 0 element of list

  dCheckSumTally = dCheckSumTally Mod 65536
  If dCheckSumTally = lCheckSum Then
```

```
        InterpretDosingData = True      'return success to caller
    Else
        IErrorCode = ERR_COMM_CHECKSUM
    End If

InterpretDosingData_Exit:
    On Error GoTo 0
    Exit Function

InterpretDosingData_Error:
    IErrorCode = Err
    Resume InterpretDosingData_Exit:

End Function
```

```
Public Function ValidateChecksum(ByVal sData As String) As Integer
    'Look at the data string passed here and get the checksum from the
    'end of the string.
    'sDATA should be a string that was returned from the device.
    'The last char in the string is a termination char preceeded by 4 bytes of checksum.

    Dim sTemp As String, iByte As Integer, r As Integer, iposition As Integer
    Dim ICheckSum As Long, ICheckSumTally As Long
    On Error GoTo ValidateChecksum_Error

    r = Len(sData)
    For iposition = 1 To r - 5
        iByte = Asc(Mid$(sData, iposition, 1))
        'iByte = CInt("&H" + Mid$(sData, iposition, 2))
        ICheckSumTally = ICheckSumTally + iByte          'add to checksum
    Next iposition

    ICheckSumTally = ICheckSumTally Mod 65536

    sTemp = "&H" + "0" + Mid$(sData, r - 2, 2) + Mid$(sData, r - 4, 2)
    ICheckSum = CLng(sTemp)
    If ICheckSumTally = ICheckSum Then ValidateChecksum = True      'pass success flag back to caller

ValidateChecksum_Exit:
    On Error GoTo 0
    Exit Function

ValidateChecksum_Error:
    Resume ValidateChecksum_Exit

End Function
```

```
Private Sub InterpretErrorFlags(DataStruct As DeviceDataStruct, ByVal iFlagsByte As Integer)
    'Break out the bits of the flags bytes passed here.
    'Put the results into the global arrays

    'if any flags exist, then set this to true
    If iFlagsByte Then DataStruct.bErrorsExist = True

    'Parse out flags separately
    DataStruct.bErrorFatal = (iFlagsByte And 2)
    DataStruct.bErrorNonFatal = (iFlagsByte And 4)
    DataStruct.bErrorDoseSize = (iFlagsByte And 8)
    DataStruct.bErrorMedRemaining = (iFlagsByte And 16)
    DataStruct.bErrorMemoryFull = (iFlagsByte And 32)
    DataStruct.bErrorBrownOut = (iFlagsByte And 64)
    'remaining upper 3 bits not used at present

End Sub
```

Comm.bas - Comm_ReadEntireMemoryCon... is


```
Public Function Comm_ReadEntireMemoryContents(DataStruct As DeviceDataStruct, lReturnError As Long) A
    Dim sOut As String, sChecksum As String, sIn As String, lErrorCode As Long, r As String

    On Error GoTo Comm_ReadEntireMemoryContents_Error

    EraseDataInMemory DataStruct
    sOut = "Rr"                         'this is the code for reading entire memory
    CreateChecksum sOut, sChecksum      'calculate a checksum
    sOut = sOut + sChecksum + "!"       'append checksum and ending string identifier

    If Not frmMain.CommDevice.PortOpen Then frmMain.CommDevice.PortOpen = True

    frmMain.CommDevice.InputLen = 0     'clear input buffer
    frmMain.CommDevice.Output = sOut    'send string to device
    r = Comm_GetDeviceReply(sIn, lErrorCode)
    If r Then                           'comm was received.  Should be at least this many bytes
        r = ValidateChecksum(sIn)
        If r = False Then
            lReturnError = ERR_COMM_CHECKSUM
    Exit Function
        End If

        r = ParseMemoryContents(DataStruct, sIn, lErrorCode)    'parse out the string
        If lErrorCode Then
            lReturnError = lErrorCode
    Exit Function
        End If

        Comm_ReadEntireMemoryContents = True    'return success to caller
        DataStruct.dLastDownloadDate = Now
        gbPatientDataNotSaved = True            'set this flag to true

    Else
        lReturnError = lErrorCode
        Exit Function
    End If

    r = Comm_ReadFirmwareVersion(DataStruct, lErrorCode)
    If lErrorCode Then
        lReturnError = lErrorCode
    End If


Comm_ReadEntireMemoryContents_Exit:
    On Error GoTo 0
    Exit Function

Comm_ReadEntireMemoryContents_Error:
    lReturnError = Err
    Resume Comm_ReadEntireMemoryContents_Exit


End Function
```

Comm.bas - Comm_SendResetClockAndBatt...


```
Public Function Comm_SendResetClockAndBattery(IReturnError As Long)
  'Resets the device clock to an offset that represents 1:00am
  'and resets the battery timer to zero.

  Dim sData As String, sOut As String, sReply As String, sChecksum As String
  Dim r As Integer, lErrorCode As Long, iTemp As Integer

  iTemp = CInt(Format(Now, "hh"))
  If iTemp = 0 Then iTemp = 24              'midnight
  iTemp = (iTemp - 1) * 6                   'calc number of 10-minute penod * hours
  iTemp = iTemp + CInt((Format$(Now, "nn") - 5) / 10)     'calc number of 10-min penods in this hour
  sData = CStr(Hex(iTemp))
  If Len(sData) < 2 Then sData = "0" + sData     'ensure string is always 2 bytes long

  sOut = "Kk" + sData                       'add data string to command
  CreateChecksum sOut, sChecksum            'calculate a checksum
  sOut = sOut + sChecksum + "!"             'append checksum and ending string identifier
  Comm_SendDataToDevice (sOut)              'send string to comm port
  r = Comm_GetDeviceReply(sReply, lErrorCode)
  If sReply = "$" Then                      'string was successfully interpreted by device
    Comm_SendResetClockAndBattery = True    'return success to caller
  ElseIf sReply = "?" Then                  'string was not interpreted properly
    IReturnError = ERR_COMM_BADRESPONSE
  Else
    IReturnError = lErrorCode
  End If

End Function
```

```
Public Function Comm_SendCustomData(DataStruct As DeviceDataStruct, ByVal sLocation As String, IReturn
  'There are 4 locations in the device, each containing a 16 byte string.
  'There first location is usually reserved for Patient ID.
  'Any string can be contained in any location.
  'Data is taken from the global structure

  Dim sData As String, sOut As String, sReply As String, sChecksum As String
  Dim r As Integer, lErrorCode As Long, sCustomData As String
  Dim i As Integer, sTemp As String

  'Determine the appropriate command for the location of the data to be stored.
  'There are 4 fields in the device containing 16 characters each.  In the original
  'device design, this was intended to contain 4 sepeate pieces of information.
  'The client has now decided that some fields are too short and others are too long.
  'Thus, the fields are combined to be one string of 64 characters.
    'Data Structure Rev level  = giLEN_REV_DATA_STRUCTURE
    'Patient name             = giLEN_PATIENT_NAME
    'ID                       = giLEN_ID
    'Drug                     = giLEN_DRUG
    'TX Center                = giLEN_TX_CENTER
    'Organ                    = giLEN_ORGAN

  'Create a 64 byte string from the various data elements to be saved
  'This string identifies the format of custom information.  If the format
  'changes in a future version, then this ID can be used to determine which
  'version of the software saved the info to the device.
  sCustomData = gsREV_DATA_STRUCTURE

  'Save the 2 digit number that represents this drug.
  'To save space, a numerical index of the Organ name is stored in the device
  i = GetDrugRefNumber()
  sTemp = CStr(i)
  If Len(sTemp) < 2 Then sTemp = "0" + sTemp          'force code to be 2 digits
  sCustomData = sCustomData + sTemp                   'concatenate result to outbound string

  'Save the 2 digit number that represents this organ
  'To save space, a numerical index of the Organ name is stored in the device
```

Comm.bas - Comm_SendCustomData


```
    i = GetOrganRefNumber()
    sTemp = CStr(i)
    If Len(sTemp) < 2 Then sTemp = "0" + sTemp       'force code to be 2 digits
    sCustomData = sCustomData + sTemp

    sTemp = DataStruct.sPatientID
    If Len(sTemp) > giLEN_ID Then
      sTemp = Left$(sTemp, giLEN_ID)                 'name is too long, trim letters of first name
    ElseIf Len(sTemp) < giLEN_ID Then
      sTemp = sTemp + Space$(giLEN_ID - Len(sTemp))  'name is too short to fill the designated length
    End If
    sCustomData = sCustomData + sTemp                'concatenate result to outbound string

    sTemp = DataStruct.sTxCenter
    If Len(sTemp) > giLEN_TX_CENTER Then
      sTemp = Left$(sTemp, giLEN_TX_CENTER)          'name is too long, trim letters of first name
    ElseIf Len(sTemp) < giLEN_TX_CENTER Then
      sTemp = sTemp + Space$(giLEN_TX_CENTER - Len(sTemp))   'name is too short to fill the designated length
    End If
    sCustomData = sCustomData + sTemp                'concatenate result to outbound string

    sTemp = DataStruct.sPatientLastName + "," + DataStruct.sPatientFirstName
    If Len(sTemp) > giLEN_PATIENT_NAME Then
      sTemp = Left$(sTemp, giLEN_PATIENT_NAME)       'name is too long, trim letters of first name
    ElseIf Len(sTemp) < giLEN_PATIENT_NAME Then
      sTemp = sTemp + Space$(giLEN_PATIENT_NAME - Len(sTemp))   'name is too short to fill the designated length
    End If
    sCustomData = sCustomData + sTemp                'concatenate result to outbound string


    'Assemble the string to be sent
    Select Case sLocation
      Case DATA_BEGIN_CUSTOM1
        sOut = "Ww"
        sData = Mid$(sCustomData, 1, 16)

      Case DATA_BEGIN_CUSTOM2
        sOut = "Xx"
        sData = Mid$(sCustomData, 17, 16)

      Case DATA_BEGIN_CUSTOM3
        sOut = "Yy"
        sData = Mid$(sCustomData, 33, 16)

      Case DATA_BEGIN_CUSTOM4
        sOut = "Zz"
        sData = Mid$(sCustomData, 49, 16)

    End Select

    'Since the device string is limited to 16 chars, ensure that only the 1st 16 chars
    'of the string are sent.
    sOut = sOut + sData              'add data string to command
    CreateChecksum sOut, sChecksum   'calculate a checksum
    sOut = sOut + sChecksum + "!"    'append checksum and ending string identifier
    Comm_SendDataToDevice (sOut)     'send string to comm port
    r = Comm_GetDeviceReply(sReply, lErrorCode)
    If sReply = "$" Then             'string was successfully interpreted by device
      Comm_SendCustomData = True     'return success to caller
    ElseIf sReply = "?" Then         'string was not interpreted properly
      lReturnError = ERR_COMM_BADRESPONSE
    Else
      lReturnError = lErrorCode
    End If

  End Function
```

Comm.bas - Comm_SendCustomData


```
Public Function Comm_SendDosingParams(DataStruct As DeviceDataStruct, lReturnError As Long)
'Sends the dosing parameters from the global structure to the device

    'Structure: "Ddttuuvvwwxxyyzzmmss "
    'Response:  "$"
    ' "tt" is Dose Size in pump ticks. Note that pump ticks per milliliter is fixed at 40. Hex value from 0 to 0xff. (Maximum dose size is currently
    5 mls or 200 decimal)
    ' "uu", "vv", "ww", "xx" are four Dose Interval values in hours between doses. Hex values between 1 and 0x18.
    ' "yy" is Number of Doses per day. Hex value from 1 to 4.
    ' "zz" is Pump Ticks per 10 mg Conversion value. Hex value. Typical value with present medication is 4 ticks per 10 milligrams.
    ' "mm" is Lockout Hours value. Number of hours to prevent dosing after a dose is taken.
    ' "ss" are the two checksum digits (hex) equal the one's compliment value of the two's compliment sum of the command characters and
    the data:. The ASCII values are simply added together in an 8 bit sum, then one is subtracted (moculo 256).

    Dim iData As Integer, sData As String, sOut As String, sReply As String
    Dim r As Integer, lErrorCode As Long, sChecksum As String, i As Integer
    Dim iLastIntervalSet As Integer

    On Error GoTo 0

    sOut = "Dd"                         'put command in string

    'Get Dose Size in pump ticks
    iData = Val(DataStruct.sDoseSize) * 40 / 100    'get dose size from global struct & convert to pump ticks (convert from mg to ml)
    sData = CStr(Hex(iData))                'convert value to a hex string
    If Len(sData) < 2 Then sData = "0" + sData    'ensure string is always 2 bytes long
    sOut = sOut + sData

    iLastIntervalSet = 1                    '1:00 am is the ref time for the first dose

    'Get Dose intervals in hours
    For i = 1 To giMaxDoseTimes             'max doses per day
      iData = 0                         'in case of conversion error, reset temp value
      If DataStruct.dPrescribedDoseTime(i) > 0 Then    'a negative number indicates no time was set
        iData = Format$(DataStruct.dPrescribedDoseTime(i), "hh")    'convert fractional day to hours
        iData = iData - iLastIntervalSet    'this time is relative tot he last interval that was set
        'change time to midnight
        If iData < 0 Then iData = 24 - Abs(iData)
        iLastIntervalSet = Format$(DataStruct.dPrescribedDoseTime(i), "hh")    'the next interval is realative to the last one that is set
      End If
      sData = CStr(Hex(iData))              'convert value to a hex string
      If Len(sData) < 2 Then sData = "0" + sData    'ensure string is always 2 bytes long
      sOut = sOut + sData
    Next i

    'Get number of doses per day
    sData = CStr(Hex(DataStruct.iDosesPerDay))    'convert value to a hex string
    If Len(sData) < 2 Then sData = "0" + sData    'ensure string is always 2 bytes long
    sOut = sOut + sData

    'Get conversion value
    iData = 0                           'in case of error, reset temp value
    iData = CInt(DataStruct.sDoseResolution)    'get dose resolution from global struct
    sData = CStr(Hex(iData))                'convert value to a hex string
    If Len(sData) < 2 Then sData = "0" + sData    'ensure string is always 2 bytes long
    sOut = sOut + sData

    'Get Dose lockout hours
    iData = 0                           'in case of error, reset temp value
    iData = CInt(DataStruct.sDoseLockoutHours)    'get lockout hour from global struct
    sData = CStr(Hex(iData))                'convert value to a hex string
    If Len(sData) < 2 Then sData = "0" + sData    'ensure string is always 2 bytes long
    sOut = sOut + sData

    CreateChecksum sOut, sChecksum          'calculate a checksum
    sOut = sOut + sChecksum + "|"           'append checksum and ending string identifier
```

```
    Comm_SendDataToDevice (sOut)              'send string to comm port
    r = Comm_GetDeviceReply(sReply, IErrorCode)
    If sReply = "$" Then                      'string was successfully interpreted by device
      Comm_SendDosingParams = True            'return success to caller
    ElseIf sReply = "?" Then                  'string was not interpreted properly
      IReturnError = ERR_COMM_BADRESPONSE
    Else
      IReturnError = IErrorCode
    End If

End Function
```

```
Public Function Comm_SendSerialNumber(DataStruct As DeviceDataStruct, IReturnError As Long) As Integer
  'Sends the serial number from the global structure to the device

  Dim sData As String, sOut As String, sReply As String, sChecksum As String
  Dim r As Integer, IErrorCode As Long

  sData = Left$(Trim(DataStruct.sSerialNumber), 10)    'trim leading spaces and use first 16 chars
  sData = sData + Space$(10 - Len(sData))              'pad the string with spaces
  sOut = "Nn" + sData                                  'add data string to command
  CreateChecksum sOut, sChecksum                       'calculate a checksum
  sOut = sOut + sChecksum + "!"                        'append checksum and ending string identifier
  Comm_SendDataToDevice (sOut)                         'send string to comm port
  r = Comm_GetDeviceReply(sReply, IErrorCode)
  If sReply = "$" Then                                 'string was successfully interpreted by device
    Comm_SendSerialNumber = True                       'return success to caller
  ElseIf sReply = "?" Then                             'string was not interpreted properly
    IReturnError = ERR_COMM_BADRESPONSE
  Else
    IReturnError = IErrorCode
  End If

End Function
```

```
Private Sub ConvertHexStringToAscii(ByVal sData, sConverted As String)
  'String Data from the device is usually returned as Hex characters.
  'Convert the string (passed in here) to an ASCII string and return to caller.
  'Such strings are items like patient name, serial number, etc.

  Dim sTemp As String, i As Integer, iTemp As Integer
  On Error Resume Next
  sConverted = ""                          'clear out any old string
  For i = 1 To Len(sData) Step 2
    sTemp = "&H" + Mid$(sData, I, 2)       'get a 2 char hex byte from string
    sTemp = Chr$(sTemp)                    'convert value to ASCII
    sConverted = sConverted + sTemp        'concatenate to existing string being built
  Next I

End Sub
```

Comm.bas - CreateChecksum


```
Private Sub CreateChecksum(sOut As String, sChecksum As String)
  'The string "sOut" will be sent to the device by another procedure.  Before it is sent.
  'this procedure calculates a checksum and returns it to the caller
  'Return the ASCII representation of the checksum value.

  Dim i As Integer, lCheckSumTally As Long, iChecksumByteLow As Integer

  For i = 1 To Len(sOut)                'calculate checksum
    lCheckSumTally = lCheckSumTally + Asc(Mid$(sOut, i, 1))
  Next i

  iChecksumByteLow = lCheckSumTally Mod 256
  'iChecksumByteHigh = lChecksumTally \ 256   'not being using by the device
  sChecksum = Hex(iChecksumByteLow - 1)        'checksum is the "one's complement value of a two's complement checksum"
  'value must always be 2 chars
  If Len(sChecksum) < 2 Then sChecksum = "0" + sChecksum          'place a leading "0" in front of checksum

End Sub
```

```
Public Sub EstablishDeviceComm()
  'This procedure continues to try and establish communication with the Device
  'until it succeeds.  When successful, control is returned to the calling procedure.
  'The purpose of this procedure is to allow the user to try cable changes, device
  'movement, etc. without having to continue pressing keys on the keyboard.

  Dim r As Integer, lErrorCode As Long

QueryDevice:
  r = Comm_CheckComm(lErrorCode)
  If r <> True Then
    DoEvents        'allow other Windows events to be processed, so we don't lock up the computer
    Wait 1          'wait an additional amount of time before trying
    GoTo QueryDevice  'try comm again
  End If

End Sub
```

```
Function Comm_InitializeCommPort() As Integer
  'Get the inital values from INI file and
  'Initialize device comm port settings

  Dim lReply As Long
  Const sSection = "Communications"

  'Get the amount of time needed for a reply to be received from the device
  giDeviceResponseWait = CInt(GetINISetting(gsAppIniFileSpec, sSection, "Device Response Wait", "50"))
  If giDeviceResponseWait < 25 Then giDeviceResponseWait = 25          'set a minimum delay time
  If giDeviceResponseWait > 500 Then giDeviceResponseWait = 500        'clamp upper limit
  frmMain.CommTimer.Interval = giDeviceResponseWait                    'set up the timer


  'Get the comm port speed settings
  giCommPort = CInt(GetINISetting(gsAppIniFileSpec, sSection, "Port", "1"))
  If giCommPort = 0 Then giCommPort = 2      'set a default of comm 2 if nothing is in the file

  gsCommDeviceSettings = GetINISetting(gsAppIniFileSpec, sSection, "Settings", "2400,n,8,2")

  'prevent device unavailable error
  If frmMain.CommDevice.PortOpen = True Then frmMain.CommDevice.PortOpen = False          'close port if open

  frmMain.CommDevice.Settings = gsCommDeviceSettings
  frmMain.CommDevice.CommPort = CStr(giCommPort)
```

```
    frmMain.CommDevice.InBufferSize = 1024
    frmMain.CommDevice.InputLen = 0
    Comm_InitializeCommPort = True                    'return success to caller

Comm_InitializeCommPort_Exit:
    Exit Function

Comm_InitializeCommPort_Error:
    Comm_InitializeCommPort = Err                     'return error to caller
    On Error GoTo 0
    Resume Comm_InitializeCommPort_Exit

End Function
```

Sub Device_OnComm()

```
'This procedure is called by the OnComm evenet of the comm control located on
'frmMain.  This is so that the code can be shared between applications.

Dim r As Integer, sTemp As String

r = frmMain.CommDevice.CommEvent

'  If r = MSCOMM_ER_RXOVER Then
'     'An over run error occured.  Ususally happens when getting events.
'     Exit Sub
'  End If
'
'  If r = MSCOMM_EV_EOF Then       'end of file flag received.
'     Exit Sub                     'who cares.  Happens during receipt of events
'  End If
'
'  If r = MSCOMM_ER_BREAK Then     'break signal received
'     Exit Sub
'  End If
'
'
'  If r = 3 Or r = 4 Or r = 5 Then 'rts, xon xoff, CD error
'     Exit Sub
'  End If
'
'
'  MsgBox "Unexpected error occured with the device.  Please try again.", , "Comm Event - " + Str$(r)
```

```
End Sub

Private Sub InterpretScoreData(DataStruct As DeviceDataStruct, ByVal sData As String, ByVal iCurrentDayPoi
  'Get score data and place into global structure.  Seems that the pointer is 0 based.
  'The value is from 0 to 4 doses taken per day.  A value of "&HFF" means that the value
  'is cleared and not set yet.

  Dim i As Integer, sTemp As String, iTempPointer As Integer

  iTempPointer = iCurrentDayPointer + 1                'start with the current day

  For i = 1 To 14                                      'get 14 days of data
    sTemp = Mid$(sData, iTempPointer + 1, 2)           'get score for this day (2 byte hex)
    DataStruct.sScoreData(i) = sTemp                   'save score
    iTempPointer = iTempPointer - 2
    If iTempPointer < 0 Then iTempPointer = 13 * 2     'end of circular buffer.  Start at bottom
  Next i

End Sub

Private Function ParseMemoryContents(DataStruct As DeviceDataStruct, sAllData As String, lErrorCode As Lo
  On Error Resume Next

  Dim i As Integer, sDoseData As String, lCheckSum As Long
  Dim sTemp As String, sConverted As String, lTemp As Long, r As Integer, sCustomData As String
  Dim sLastIntervalTime As String, iStartingLocation  As Integer
  ReDim sTempList(25) As String

  On Error GoTo ParseMemoryContents_Error

  'Get Clock
  'The device clock reports the number of 10 minute intervals that have passed since 1 am on
  'the morning of the first dose.  Thus, calculate when the first dose occurred for later use.
  sTemp = "&H" + "0" + Mid$(sAllData, DATA_BEGIN_CLOCK + 2, 2) + Mid$(sAllData, DATA_BEGIN_CLOCK, 2)
  'calculate back to the date and time the clock should have started.
  DataStruct.dDeviceRefDateTime = CDbl(DateAdd("n", -(CLng(sTemp)) * 10, Now))
  DataStruct.lDeviceInitDate = CLng(DataStruct.dDeviceRefDateTime)


  'Get Battery Change Timer
  sTemp = "&H" + "0" + Mid$(sAllData, DATA_BEGIN_BATTERY_CHANGE_TIMER + 2, 2) + Mid$(sAllData,
   DATA_BEGIN_BATTERY_CHANGE_TIMER, 2)
  lTemp = CLng(sTemp) / 6    'convert to hours (there are 6 "ten-minute" intervals in one hour)
  DataStruct.sBatteryChangeTimer = Format$(CStr(lTemp / 24), "##0.0 days")      'convert to days and store it

  'Get Dosing Event Data
  sTemp = "&H" + "0" + Mid$(sAllData, DATA_BEGIN_COMPLIANCE_POINTER + 2, 2) + Mid$(sAllData,
   DATA_BEGIN_COMPLIANCE_POINTER, 2)  'get pointer
  lTemp = CLng(sTemp)          'convert hex value to a long value
  If lTemp Then sDoseData = Mid$(sAllData, DATA_BEGIN_COMPLIANCE_DATA, (lTemp - 132) * 2)          'get string

  'Get Compliance Checksum
  sTemp = "&H" + "0" + Mid$(sAllData, DATA_BEGIN_COMPLIANCE_CHECKSUM + 2, 2) + Mid$(sAllData,
   DATA_BEGIN_COMPLIANCE_CHECKSUM, 2)
  lCheckSum = CLng(sTemp)
  r = InterpretDosingData(DataStruct, sDoseData, lTemp, lCheckSum, lErrorCode)       'parse out the events and place in global structure
  If r = False Then   'bad checksum data
    GoTo ParseMemoryContents_Exit
  End If

  'Get Patient Score Data
  sTemp = Mid$(sAllData, DATA_BEGIN_SCORE, 28)
  'parse the 14 days of dosing and store in global structure
  If Len(sTemp) > 0 Then
    lTemp = CLng("&H0" + Mid$(sAllData, DATA_BEGIN_DOSE_SCORE_DAY_POINTER, 2))
```

Comm.bas - ParseMemoryContents

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```
    If lTemp Then InterpretScoreData DataStruct, sTemp, CInt(lTemp)        'parse out the scores and place in global structure
End If

'Get Error Flags
sTemp = Mid$(sAllData, DATA_BEGIN_ERROR_FLAGS, 2)
If Len(sTemp) > 0 Then InterpretErrorFlags DataStruct, Val(sTemp)          'parse out the flags and save in global structure

'Get Medication remaining in device
sTemp = "&H0" + Mid$(sAllData, DATA_BEGIN_MED_REMAINING + 2, 2) + Mid$(sAllData, DATA_BEGIN_MED_REMAINING, 2)
DataStruct.sMedRemaining = CStr(CSng(sTemp / 40) * 100) + " mg"        'pump ticks are fixed at 40 per milliliter (100 mg per ml)

'Get Dose Lockout Hours
sTemp = "&H0" + Mid$(sAllData, DATA_BEGIN_DOSE_LOCKOUT_HOURS, 2)
DataStruct.sDoseLockoutHours = CStr(CSng(sTemp))

'Get Doses per day
sTemp = "&H0" + Mid$(sAllData, DATA_BEGIN_DOSES_PER_DAY, 2)
DataStruct.iDosesPerDay = CInt(sTemp)

'Get Dose Resolution
sTemp = "&H0" + Mid$(sAllData, DATA_BEGIN_DOSE_CONVERSION, 2)
DataStruct.sDoseResolution = CStr(CSng(sTemp))


'Get Dose Intervals
sLastIntervalTime = "1:00"

'Get Dose Interval 1 (alarm time)
sTemp = "&H0" + Mid$(sAllData, DATA_BEGIN_DOSE_INTERVAL1, 2)
If Val(sTemp) Then
   sTemp = DateAdd("H", CDbl(sTemp), sLastIntervalTime)        'the first dose is relative to 1:00 am
   sLastIntervalTime = sTemp
   DataStruct.dPrescribedDoseTime(1) = TimeValue(sTemp)
Else
   DataStruct.dPrescribedDoseTime(1) = -1        'this value indicates that no time was received
End If

'Get Dose Interval 2 (alarm time)
sTemp = "&H0" + Mid$(sAllData, DATA_BEGIN_DOSE_INTERVAL2, 2)
If Val(sTemp) Then
   sTemp = DateAdd("H", CDbl(sTemp), sLastIntervalTime)        'the first dose is relative to 1:00 am
   sLastIntervalTime = sTemp
   DataStruct.dPrescribedDoseTime(2) = TimeValue(sTemp)
Else
   DataStruct.dPrescribedDoseTime(2) = -1        'this value indicates that no time was received
End If

'Get Dose Interval 3 (alarm time)
sTemp = "&H0" + Mid$(sAllData, DATA_BEGIN_DOSE_INTERVAL3, 2)
If Val(sTemp) Then
   sTemp = DateAdd("H", CDbl(sTemp), sLastIntervalTime)        'the first dose is relative to 1:00 am
   sLastIntervalTime = sTemp
   DataStruct.dPrescribedDoseTime(3) = TimeValue(sTemp)
Else
   DataStruct.dPrescribedDoseTime(3) = -1        'this value indicates that no time was received
End If

'Get Dose Interval 4 (alarm time)
sTemp = "&H0" + Mid$(sAllData, DATA_BEGIN_DOSE_INTERVAL4, 2)
If Val(sTemp) Then
   sTemp = DateAdd("H", CDbl(sTemp), sLastIntervalTime)        'the first dose is relative to 1:00 am
   sLastIntervalTime = sTemp
   DataStruct.dPrescribedDoseTime(4) = TimeValue(sTemp)
Else
   DataStruct.dPrescribedDoseTime(4) = -1        'this value indicates that no time was received
End If


'Get Dose Size
```

Comm.bas - ParseMemoryContents


```
    sTemp = "&H0" + Mid$(sAllData, DATA_BEGIN_DOSE_SIZE, 2)
    If IsNumeric(sTemp) Then
        DataStruct.sDoseSize = CStr(CSng(sTemp) / 40 * 100)      'convert from mg to ml
    Else
        DataStruct.sDoseSize = ""
    End If


    'There are 4 fields in the device containing 16 characters each.  In the original
    'device design, this was intended to contain 4 seperate pieces of information.
    'The client has now decided that some fields are too short and others are too long.
    'Thus, the fields are combined to be one string of 64 characters.
        'Patient name   = giLEN_PATIENT_NAME
        'ID            = giLEN_ID
        'Drug          = giLEN_DRUG
        'TX Center     = giLEN_TX_CENTER
        'Organ         = giLEN_ORGAN

    'Send a message to the user if the revision level is higher than the one
    'this software is using to send custom data to the device.
    'The user must upgrade to the current version is order to get accurate custom data.
    'This code should also handle any previous versions that saved data to the device.

    'Get Custom string 1
    sTemp = Mid$(sAllData, DATA_BEGIN_CUSTOM1, 32)
    ConvertHexStringToAscii sTemp, sConverted
    sCustomData = sConverted

    'Get Custom string 2
    sTemp = Mid$(sAllData, DATA_BEGIN_CUSTOM2, 32)
    ConvertHexStringToAscii sTemp, sConverted
    sCustomData = sCustomData + sConverted

    'Get Custom string 3
    sTemp = Mid$(sAllData, DATA_BEGIN_CUSTOM3, 32)
    ConvertHexStringToAscii sTemp, sConverted
    sCustomData = sCustomData + sConverted

    'Get Custom string 4
    sTemp = Mid$(sAllData, DATA_BEGIN_CUSTOM4, 32)
    ConvertHexStringToAscii sTemp, sConverted
    sCustomData = sCustomData + sConverted


    'Pull apart the 64 char string into its sub-components
    'Get the custom data structure revision level that was previously saved to the device.
    'Note: this is not the same as the major and minor versions of the host software.
    iStartingLocation = 1
    sTemp = Mid$(sAllData, iStartingLocation, giLEN_REV_DATA_STRUCTURE)
    ConvertHexStringToAscii sTemp, sConverted
    'The device custom data was apparently saved with a newer version of software than this one.
    If Val(sConverted) > gsREV_DATA_STRUCTURE Then
        lErrorCode = ERR_NEWER_HOST_SOFTWARE
        GoTo ParseMemoryContents_Exit
    End If

    'Determine the real name of the Drug by the reference number received from the device
    iStartingLocation = iStartingLocation + giLEN_REV_DATA_STRUCTURE
    sTemp = Trim(Mid$(sCustomData, iStartingLocation, giLEN_DRUG))
    r = Val(sTemp)
    If r > 0 And r < UBound(gsDrugNames) Then DataStruct.sDrug = gsDrugNames(r)

    'Determine the real name of the Organ by the reference number received from the device
    iStartingLocation = iStartingLocation + giLEN_DRUG
    sTemp = Trim(Mid$(sCustomData, iStartingLocation, giLEN_ORGAN))
    r = Val(sTemp)
    If r > 0 And r < UBound(gsOrganNames) Then DataStruct.sOrgan = gsOrganNames(r)

    iStartingLocation = iStartingLocation + giLEN_ORGAN
```

Comm.bas - ParseMemoryContents


```
    DataStruct.sPatientID = Trim(Mid$(sCustomData, iStartingLocation, giLEN_ID))

    iStartingLocation = iStartingLocation + giLEN_ID
    DataStruct.sTxCenter = Trim(Mid$(sCustomData, iStartingLocation, giLEN_TX_CENTER))

    iStartingLocation = iStartingLocation + giLEN_TX_CENTER
    r = ParseDelimString(Trim(Mid$(sCustomData, iStartingLocation, giLEN_PATIENT_NAME)), ",", sTempList())
    DataStruct.sPatientLastName = Trim$(sTempList(1))
    DataStruct.sPatientFirstName = Trim$(sTempList(2))

    'Get Serial Number
    sTemp = Mid$(sAllData, DATA_BEGIN_SERIAL_NUMBER, 20)
    ConvertHexStringToAscii sTemp, sConverted
    DataStruct.sSerialNumber = Trim(sConverted)
    ParseMemoryContents = True      'send success to caller


ParseMemoryContents_Exit:
    On Error GoTo 0
    Exit Function

ParseMemoryContents_Error:
    'force a checksum error here because any type of error is likely due to a checksum problem
    lErrorCode = ERR_COMM_CHECKSUM
    Resume ParseMemoryContents_Exit

End Function
```

Public Sub PollDeviceContinually(SourceForm As Form)

```
    'This procedure continues to try and establish communication with the Device
    'until it succeeds.  When successful, control is returned to the calling procedure.
    'The purpose of this procedure is to allow the user to try cable changes, device
    'movement, etc. without having to continue pressing keys on the keyboard.

    Dim r As Integer, bProcedureInProgress As Boolean, lErrorCode As Long

    If bProcedureInProgress Then Exit Sub
    If gbCommBusy Or gbCommReplyPending Then Exit Sub
    bProcedureInProgress = True      'prevent recursive calls to this procedure


QueryDevice:
    DoEvents          'allow other Windows events to be processed, so we don't lock up the computer
    If gbCommOK = True Then    'no need to poll as often if device was working the last time we checked
        Wait 5        'wait an additional amount of time before trying
    Else
        Wait 0.05     'poll faster until a good comm is made
    End If

    If Not gbCommBusy And Not gbCommReplyPending Then      'poll only if port not busy
        If gbKeepPollingDevice = False Then Exit Sub
        SourceForm.imgPolling.Visible = True
        SourceForm.imgPolling.Refresh
        r = Comm_CheckComm(lErrorCode)
        If gbKeepPollingDevice = False Then Exit Sub
        If r = True Then              'comm is working
            'display status has not yet been updated
            If Not gbCommOK Then DisplayCommOk SourceForm

        Else                          'comm is NOT working
            'display status has not yet been updated
            If gbCommOK Then DisplayCommError SourceForm

        End If
    End If

    Wait 0.05  'allow polling icon to be viewed
    If gbKeepPollingDevice = False Then Exit Sub
```

Comm.bas - PollDeviceContinually


```
    ' SourceForm.imgPolling.Visible = False

    If r = ERR_COMM_TIMEOUT Then    'send an additional error message that no reply was received
      MsgBox "No response was received to a wake up command that was sent to the DosPro device. ", , "Communication Error"
    End If


    'flag has not been reset yet
    If gbKeepPollingDevice Then GoTo QueryDevice    'try comm again

    bProcedureInProgress = False    'allow future calls to this procedure now that we are finished

End Sub
```

```
Public Sub Comm_SendDataToDevice(ByVal sOut As String)
    Dim dGoAheadTime As Double
    'A data string should have been assembled by another procedure and is now
    'ready to sent to the device.

    'If another command is in progress then wait till it is done
    'If the flags have not been reset after this delay, then exit loop anyway
    'This prevents lockups inside this loop in case there is a problem elsewhere
    dGoAheadTime = DateAdd("s", 5, CDbl(Now))
    Do While gbCommBusy Or gbCommReplyPending
      DoEvents
      DoEvents
      DoEvents
      If CDbl(Now) > dGoAheadTime Then Exit Do
    Loop

    gbCommBusy = True                    'set busy flag  (gets reset if timeout or reply not received)
    'if comm port is not open then open it
    If Not frmMain.CommDevice.PortOpen Then frmMain.CommDevice.PortOpen = True
    frmMain.CommDevice.InputLen = 0      'clear input buffer
    frmMain.CommDevice.Output = sOut     'send string to device

End Sub
```

```
Private Sub SetCommTimer(iTime As Integer)
    'The comm timer determines whether or not a reply has come back from the device.
    'The timer fires an event if the iTime has passed without the timer being reset.
    'Reset the timer to the interval passed in, then start it.
    'Set the comm busy flag, then return to caller

    frmMain.CommTimer.Enabled = False       'disable timer while resetting it
    frmMain.CommTimer.Interval = iTime      'set interval
    gbCommTimerExpired = False              'reset timer expiration flag
    frmMain.CommTimer.Enabled = True        'start timer

End Sub
```

Comm.bas - SetCommTimer


```
Attribute VB_Name = "modPrinting"
Option Explicit

Public gbPrintFormLoading As Integer
Public gbPrinterErrorDetected As Integer
Public giTotalPrintPages As Integer             'track the number of pages being prevewed
Public gbPreventPreviewUpdates As Integer
Public giPrintedPageNumber As Integer
Public gbPageNumberSuspend As Integer           'if true, don't print page number for the active page (probably cover picture)

Public giFontOptSel As Integer
Public gsSelectPrintPages As String
Public gbPrinterErrorReceived As Integer        'tells other procs that error occurred  Proc must reset flag
Public gbPrintSpoolingInProgress As Integer     'prevent crashes during spooling

Private Sub btnPrinter_Preview_Click_Proc()
'  If gTotalPrintPages > 1 Then                 'there is more than one page to print
'     frmSelectPages.Show MODAL
'     Select Case gsSelectPrintPages
'        Case "All"
   frmPrint.MousePointer = vbHourglass
   gbPrintSpoolingInProgress = True
   frmPrint.vsPrinter1.Action = paPrintAll      'print all pages
   gbPrintSpoolingInProgress = False
'
'        Case "Page"
'          frmPrint.MousePointer = vbHourglass
'          gbPrintSpoolingInProgress = True
'          frmPrint.vsPrinter1.Action = paPrintPage    'print current page only
'          gbPrintSpoolingInProgress = False
'
'        Case ""
'          'nothing to do
'          gbPrintSpoolingInProgress = False
'     End Select
'
'  Else   'printing a single page that is not a picture
'     frmPrint.MousePointer = vbHourglass
'     gbPrintSpoolingInProgress = True
'     frmPrint.vsPrinter1.Action = paPrintAll          'print all pages
'     gbPrintSpoolingInProgress = False
'
'  End If
```

```
    frmPrint.btnClose.Enabled = True            'allow button to show
    frmPrint.btnPrintNow.Enabled = True
    frmPrint.MousePointer = vbDefault
    DoEvents

End Sub

Private Sub DrawHorizontalLine(cPrinter As Control, lPenColor As Long)
    ' frmPrint.vsPrinter1.FontSize = dgBodyTextSize
    ' frmPrint.vsPrinter1 = ""                  'skip a line from above
    ' Exit Sub

    'Draw a horizontal divider on the page
    'Usually divides the header or topic from the rest of the page

    cPrinter.FontSize = 12
    cPrinter = ""                   'skip a line from above
    cPrinter.PenStyle = 0           '0=solid 2=dot
    cPrinter.PenWidth = 10          'set pen width
    cPrinter.PenColor = lPenColor   'set pen color
    cPrinter.BrushColor = lPenColor


    'Print line only across a portion of page
    cPrinter.X1 = (cPrinter.PageWidth / 2) - (cPrinter.PageWidth * 0.25)
    cPrinter.X2 = (cPrinter.PageWidth / 2) + (cPrinter.PageWidth * 0.25)

    cPrinter.Y1 = cPrinter.CurrentY
    cPrinter.Y2 = cPrinter.CurrentY + 50

    cPrinter.Draw = 2               '1=line, 2=rectangle
End Sub

Private Sub PrintAllPatientsSummary()
    Dim I As Integer, lErrorCode As Long, sTableFormat As String, sTable As String, sList As String
    Dim fFontSize As Single, lCount As Integer

    On Error Resume Next

    'Prepare progress guage
    With frmPrint
        .pnlProgress.FloodPercent = 0
        .pnlProgressContainer.Visible = True
        .pnlProgressContainer.Refresh
    End With
    InitPageProperties
    fFontSize = 10


    'Print the logo on the first page
    With frmPrint.vsPrinter1
        .X1 = 700
        .X2 = frmPrint.vsPrinter1.X1 + frmPrint.picLogo.Width
        .Y1 = 500
        .Y2 = frmPrint.vsPrinter1.Y1 + frmPrint.picLogo.Height
        .Picture = frmPrint.picLogo.Picture
    End With


    'Print Information Header
    gbPageNumberSuspend = False
    With frmPrint.vsPrinter1
```

Printing.bas - PrintAllPatientsSumm


```
        .FontName = "Arial"
        .FontBold = True
        .TextAlign = taCenterTop        'center text used in paragraphs
        .CurrentY = 1440 * 1            'print name on this line
        .FontSize = fFontSize * 1.6     'set font size
        .FontItalic = True
        frmPrint.vsPrinter1 = "All Patient's Summary"       'print name
        .FontSize = fFontSize * 1.2     'set font size
        .FontItalic = False
        DrawHorizontalLine frmPrint.vsPrinter1, &H40000     'Draw a color line
        frmPrint.vsPrinter1 = ""                            'skip a line
        frmPrint.vsPrinter1 = frmAllPatients.cmboDataToView.Text + " with " + frmAllPatients.Label1(0).Caption
        frmPrint.vsPrinter1 = "Date Range:    " + frmAllPatients.cmboDateSelection.Text + "  from " + frmAllPatients.txtStartDate.Value + " to "
        + frmAllPatients.txtEndDate.Value

        frmPrint.vsPrinter1 = ""                            'skip a line
        .TextAlign = taCenterTop
        .FontBold = False
        .TableBorder = tbNone
        .FontSize = fFontSize * 1.1     'set font size
        .Table = sTable                 'send out table

        frmPrint.vsPrinter1 = ""        'skip a line
        frmPrint.vsPrinter1 = ""        'skip a line
        .LineSpacing = 90               ' % of current font
        .TextAlign = taCenterTop        'center text
    End With

    'Print the report Data
    sTableFormat = "<2400|<1800|>1700|>1700|>1000;"
    'Get the column titles from grid
    With frmAllPatients.grid
      .Row = 0
      .Col = 0
      sList = .Text
      .Col = 1
      sList = sList + "|" + .Text
      .Col = 2
      sList = sList + "|" + .Text
      .Col = 3
      sList = sList + "|" + .Text
      .Col = 4
      sList = sList + "|" + .Text
    End With
    sTable = sTableFormat + sList

    With frmPrint.vsPrinter1
      .TableBorder = tbBottom
      .FontSize = 10
      .FontBold = True
      .Table = sTable               'send out header
      frmPrint.vsPrinter1 = ""
    End With


    'Print the information from the grid control
    With frmAllPatients.grid
      iCount = .Rows - 1
      sList = ""
      For i = 1 To iCount           'number of patients in grid
        .Row = i
        .Col = 0
        sList = sList + .Text
        .Col = 1
        sList = sList + "|" + .Text
        .Col = 2
        sList = sList + "|" + .Text
        .Col = 3
        sList = sList + "|" + .Text
```

Printing.bas - PrintAllPatientsSumm


```
            .Col = 4
            sList = sList + "|" + .Text + ";"

            frmPrint.pnlProgress.FloodPercent = (i / iCount) * 100
            frmPrint.pnlProgressContainer.Refresh
        Next i
    End With

    sTable = sTableFormat + sList
    With frmPrint.vsPrinter1
        .FontSize = fFontSize * 0.9  'set font size
        .LineSpacing = 80            ' % of current font
        .TextAlign = taCenterTop
        .TableBorder = tbNone
        .Table = sTable              'send out table
    End With

    On Error GoTo 0
    frmPrint.pnlProgressContainer.Visible = False        'turn off progress indicator
    frmPrint.pnlProgressContainer.Refresh

End Sub
```

```
Private Sub PrintPatientDosingReport()

    Dim I As Integer, lErrorCode As Long, sTableFormat As String, sTable As String, sList As String
    Dim fFontSize As Single, iCount As Integer, bItemChecked As Boolean

    On Error Resume Next

    'Print Cover Art to the Print preview control if needed and available
    '   If frmPrint.lbPictures.ListIndex > 0 Then     'a cover is chosen
    '     If FileExists("covers\" + sgCurrentCoverName, lErrorCode) Then    'look for a bitmap on disk
    '       'Print preview the Picture
    '       gbPageNumberSuspend = True
    '       LoadPictureToPrinterControl True       'get cover
    '       InitPageProperties
    '       frmPrint.vsPrinter1.Action = 4         'start a new page
    '       gbPageNumberSuspend = False
    '
    '     End If
    '   End If

    'Prepare progress guage
    With frmPrint
        .pnlProgress.FloodPercent = 0
        .pnlProgressContainer.Visible = True
        .pnlProgressContainer.Refresh
    End With
    InitPageProperties
    fFontSize = 10


    'Print the logo on the first page
    With frmPrint.vsPrinter1
        .X1 = 700
        .X2 = frmPrint.vsPrinter1.X1 + frmPrint.picLogo.Width
        .Y1 = 500
        .Y2 = frmPrint.vsPrinter1.Y1 + frmPrint.picLogo.Height
        .Picture = frmPrint.picLogo.Picture
    End With


    'Print Information Header
    gbPageNumberSuspend = False
    With frmPrint.vsPrinter1
        .FontName = "Arial"
```

Printing.bas - PrintPatientDosingRe

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```
        .FontSize = fFontSize * 1.6    'set font size
        .FontBold = True
        .FontItalic = True
        'TextColor =
        .TextAlign = taCenterTop       'center text used in paragraphs
        .CurrentY = 1440 * 1           'print name on this line
        frmPrint.vsPrinter1 = "Patient Dosing Report"      'print name
        .FontSize = fFontSize * 1.2    'set font size
        .FontItalic = False
        frmPrint.vsPrinter1 = PAT_DATA.sPatientLastName + ", " + PAT_DATA.sPatientFirstName
        DrawHorizontalLine frmPrint.vsPrinter1, &H40000      'Draw a color line
    End With

    sTableFormat = "<1400|<2800|<1400|<2800;"
    sTable = sTableFormat + gsCustomLblPatientID + ":|" + PAT_DATA.sPatientID + "|"
    sTable = sTable + gsCustomLblTxCenter + ":|" + PAT_DATA.sTxCenter + ";"
    sTable = sTable + gsCustomLblDrug + ":|" + PAT_DATA.sDrug + "|"
    sTable = sTable + gsCustomLblOrgan + ":|" + PAT_DATA.sOrgan + ";"
    With frmPrint.vsPrinter1
      frmPrint.vsPrinter1 = ""                    'skip a line
      .TextAlign = taCenterTop
      .FontBold = True
      .TableBorder = tbNone
      .FontSize = fFontSize * 1.1      'set font size
      .Table = sTable                  'send out table

      frmPrint.vsPrinter1 = ""         'skip a line
      frmPrint.vsPrinter1 = ""         'skip a line
      .LineSpacing = 90                '% of current font
      .TextAlign = taCenterTop         'center text

      sList = "Events Types Shown: "
      If frmPatientDosingReport.chkDoses.Value Then
        sList = sList + "Doses Taken"
        bItemChecked = True
      End If

      If frmPatientDosingReport.chkDoseChanged Then
        If bItemChecked Then sList = sList + " and "
        sList = sList + "Dose Size Changes"
        bItemChecked = True

        If frmPatientDosingReport.chkUserDefined Then
          If bItemChecked Then sList = sList + " and "
          sList = sList + "User Entries"
          bItemChecked = True
        End If

        If Not bItemChecked Then
          sList = sList + "None"
        End If
        frmPrint.vsPrinter1 = ""                  'skip a line
        .TextAlign = taCenterTop
        .FontSize = fFontSize * 0.9               'set font size
        frmPrint.vsPrinter1 = sList
      End If
    End With

    'Print the report Data
    frmPrint.vsPrinter1 = ""                      'skip a line
    frmPrint.vsPrinter1.TextAlign = taCenterTop
    PrintDosingEventsHeader sTableFormat
    'Print the information from the grid control
    With frmPatientDosingReport.grid
      iCount = .Rows - 1
      sList = ""
      For i = 1 To iCount          'number of patients in grid
```

```
            .Row = i
            .Col = 0
            sList = sList + .Text
            .Col = 1
            sList = sList + "|" + .Text
            .Col = 2
            sList = sList + "|" + .Text
            .Col = 3
            sList = sList + "|" + .Text
            .Col = 4
            sList = sList + "|" + .Text
            .Col = 5
            sList = sList + "|" + .Text + ";"

            frmPrint.pnlProgress.FloodPercent = (i / iCount) * 100
            frmPrint.pnlProgressContainer.Refresh
        Next i
    End With

    sTable = sTableFormat + sList
    With frmPrint.vsPrinter1
        .FontSize = fFontSize * 0.9  'set font size
        .LineSpacing = 80            ' % of current font
        .TextAlign = taCenterTop
        .Table = sTable              'send out table
    End With


    On Error GoTo 0
    frmPrint.pnlProgressContainer.Visible = False        'turn off progress indicator
    frmPrint.pnlProgressContainer.Refresh

End Sub
```

```
Sub PrintDosingEventsHeader(sTableFormat As String)
    Dim sTable As String
    Dim fPrevFont As Single, bPrevBold As Boolean, sList As String

    fPrevFont = frmPrint.vsPrinter1.FontSize

    'Print the information from the grid control
    'Pass table format back to caller
    sTableFormat = "<2100|<1600|<1000|<1700|<1700|<1700;"
    With frmPatientDosingReport.grid
        sList = ""
        .Row = 0
        .Col = 0
        sList = sList + .Text
        .Col = 1
        sList = sList + "|" + .Text
        .Col = 2
        sList = sList + "|" + .Text
        .Col = 3
        sList = sList + "|" + .Text
        .Col = 4
        sList = sList + "|" + .Text
        .Col = 5
        sList = sList + "|" + .Text + ";"
    End With


    sTable = sTableFormat + sList
    frmPrint.vsPrinter1.TableBorder = tbBottom
    frmPrint.vsPrinter1.FontSize = 10
    frmPrint.vsPrinter1.FontBold = True
    frmPrint.vsPrinter1.Table = sTable          'send out header
    frmPrint.vsPrinter1 = ""
```

```
    'Put setting back to previous ones
    frmPrint.vsPrinter1.TableBorder = tbNone
    frmPrint.vsPrinter1.FontSize = fPrevFont
    frmPrint.vsPrinter1.FontBold = bPrevBold

End Sub
```

```
Public Sub LoadPictureToPrinterControl(ByVal bCover)
    'Set the printer control to size a picture and copy
    'picture from holding area to the print preview control.
    'if the picture to be displayed is a cover.
    'then the bCover flag should be set to true by caller.
    'otherwise it is assumed to be a border.

    Dim iPaperWidth%, iPaperHeight%, iNonPrintWidth%, iNonPrintHeight%
    frmPrint.vsPrinter1.PhysicalPage = True          'set physical page to paper dimension
    iPaperWidth = frmPrint.vsPrinter1.PageWidth      'determine size of paper
    iPaperHeight = frmPrint.vsPrinter1.PageHeight
    frmPrint.vsPrinter1.PhysicalPage = False         'return printer to printable area
    iNonPrintWidth = (iPaperWidth - frmPrint.vsPrinter1.PageWidth) / 2
    iNonPrintHeight = (iPaperHeight - frmPrint.vsPrinter1.PageHeight) / 2

    If iNonPrintWidth < 350 Then iNonPrintWidth = 350      'make a minimum margin
    If iNonPrintHeight < 350 Then iNonPrintHeight = 350    'make a minimum margin

    frmPrint.vsPrinter1.X1 = iNonPrintWidth
    frmPrint.vsPrinter1.X2 = frmPrint.vsPrinter1.PageWidth - iNonPrintWidth
    frmPrint.vsPrinter1.Y1 = iNonPrintHeight
    frmPrint.vsPrinter1.Y2 = frmPrint.vsPrinter1.PageHeight - iNonPrintWidth
    ' frmPrint.vsPrinter1.Draw = 2      'picture holder only

    frmPrint.vsPrinter1.Picture = LoadPicture("graphics\" & "deco.wmf")

End Sub
```

```
Private Sub InitPageMargins()
    'Set margins
    'Margins don't seem to set properly until the next page is created.
    'That's why they can be set only once before printing begins.

    frmPrint.vsPrinter1.MarginTop = 1350          'top margin
    frmPrint.vsPrinter1.MarginBottom = 1500       'bottom margin

    frmPrint.vsPrinter1.MarginLeft = 1725         'left margin
    frmPrint.vsPrinter1.MarginRight = 1700        'right margin  (from right edge)

End Sub
```

Printing.bas - InitPageProperties


```
Private Sub InitPageProperties()
  'Reset margins for text and initialize other items
  frmPrint.vsPrinter1.LineSpacing = 100          '100% of current font
  'Set the normal attributes here
  '
  '
  frmPrint.vsPrinter1.TextAlign = 0              'set centering back to normal

End Sub
```

```
Private Sub PrintPageDate()
  'Print Date
  Dim lTextHeight As Long, lTextWidth As Long, sText$
  'print date for the above tabs only
  'Rather than using .TextAlign property, text is centered here using this method
  'to ensure page centering regardless of margins or paragraph settings
  InitPageProperties
  frmPrint.vsPrinter1.FontName = "Arial"
  frmPrint.vsPrinter1.FontSize = 8
  sText = "Printed: " + Date$ + " with " + App.Title + " software."
  frmPrint.vsPrinter1.Measure = sText            'set string to measure
  lTextHeight = frmPrint.vsPrinter1.TextHei      'get text height
  lTextWidth = frmPrint.vsPrinter1.TextWid       'get text width
  frmPrint.vsPrinter1.CurrentX = (frmPrint.vsPrinter1.PageWidth - lTextWidth) / 2

  If frmPrint.vsPrinter1.CurrentY < 13000 Then
    frmPrint.vsPrinter1.CurrentY = frmPrint.vsPrinter1.PageHeight - (frmPrint.vsPrinter1.MarginBottom + (2.5 * lTextHeight))   'set line to very
    bottom
  Else
    frmPrint.vsPrinter1.CurrentY = frmPrint.vsPrinter1.PageHeight - (frmPrint.vsPrinter1.MarginBottom + (0.1 * lTextHeight))   'set line to very
    bottom
  End If

  frmPrint.vsPrinter1 = sText

  sText = "Copyright 1998 by SangStat Medical Corporation"
  frmPrint.vsPrinter1.Measure = sText            'set string to measure
  lTextWidth = frmPrint.vsPrinter1.TextWid       'get text width
  frmPrint.vsPrinter1.CurrentX = (frmPrint.vsPrinter1.PageWidth - lTextWidth) / 2
  frmPrint.vsPrinter1 = sText

End Sub
```

```
Public Sub PrintPageNumber()
  'Print page number if check box is active on form
  giPrintedPageNumber = giPrintedPageNumber + 1      'increment page number for next time
  If gbPageNumberSuspend = False Then
    frmPrint.vsPrinter1.HdrFontSize = 8
    frmPrint.vsPrinter1.Footer = "|Dosing Report     " + PAT_DATA.sPatientLastName + ", " + PAT_DATA.sPatientFirstName + ": " +
    PAT_DATA.sPatientID + "     Page " + CStr(giPrintedPageNumber)
  Else
    frmPrint.vsPrinter1.Footer = ""   'must print a blank footer otherwise old page # will show
  End If

End Sub
```

Printing.bas - RefreshPreview

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```
Public Sub RefreshPreview()

    Static bRefreshPreviewInProgress As Integer
    'prevent recursive calls to here
    If bRefreshPreviewInProgress = True Then Exit Sub
    If gbPreventPreviewUpdates Then Exit Sub
    bRefreshPreviewInProgress = True

    frmPrint.MousePointer = vbHourglass
    frmPrint.HScroll1.Enabled = False
    frmPrint.HScroll1.Refresh
    frmPrint.HScroll1.Value = 1
    DoEvents
    On Error GoTo 0                    'reset error processing

    frmPrint.btnRefresh.Enabled = False
    frmPrint.btnRefresh.Refresh

    frmPrint.btnPrintNow.Enabled = False
    frmPrint.btnPrintNow.Refresh

    frmPrint.btnClose.Enabled = False          'disable buttons until preview build is complete
    frmPrint.btnClose.Refresh

'   frmPrint.btnFormat.Enabled = False
'   frmPrint.btnFormat.Refresh
    DoEvents

    giTotalPrintPages = 0                  'reset the page counter
    giPrintedPageNumber = 1


    frmPrint.vsPrinter1.Preview = True         'print to screen
    frmPrint.vsPrinter1.Footer = ""            'Clear the footer
'   frmPrint.vsPrinter1.HdrFontName = "font name goes here"  'Controls footer also
'   frmPrint.vsPrinter1.HdrFontSize = ??  'Controls footer also

    'Send information to the preview screen
    'Initialize print job
    InitPageMargins

    If gbPrinterErrorDetected Then GoTo RefreshPreview_Exit

    frmPrint.vsPrinter1.PreviewPage = 1        'show 1st page
    frmPrint.vsPrinter1.PreviewMode = 0        '0=screen compatible, 1=print compat, 2 = force monochrome
    frmPrint.vsPrinter1.PageBorder = 0         'no page border
    frmPrint.vsPrinter1.TextAlign = 0          'left align text

    '" Call LoadPictureToPrinterControl(False)
    Select Case gsActiveFormName

      Case "frmPatientSummary"

      Case "frmAllPatients"
        Call PrintAllPatientsSummary

      Case "frmPatientDosingReport"
        Call PrintPatientDosingReport

    End Select

    PrintPageDate                      'print date for last recipe

    frmPrint.vsPrinter1.Action = paEndDoc      'END DOC
    frmPrint.vsPrinter1.Visible = True
    'vb5 says object does not support this method   frmPrint.vsPrinter1.Refresh
    Call UpdatePageButtons
```

Printing.bas - RefreshPreview


```
    frmPrint.HScroll1.Max = giTotalPrintPages

RefreshPreview_Exit:
    frmPrint.btnClose.Enabled = True            'enable buttons
    DoEvents
    bRefreshPreviewInProgress = False           'allow future calls to this procedure

    frmPrint.btnPrintNow.Enabled = True
    frmPrint.MousePointer = vbDefault
    DoEvents

End Sub
```

```
Public Sub SetPreviewSize()
    Dim bHeightLimit%, fTemp As Single

    frmPrint.MousePointer = vbHourglass
    ' frmprint.Refresh      'a refresh of the form causes controls inside a frame to disappear
    '    frmPrint.vsPrinter1.Visible = False
    '    frmPrint.vsViewPort1.Visible = False
    DoEvents

    If (frmPrint.vsPrinter1.PageHeight / frmPrint.vsPrinter1.PageWidth) > (frmPrint.vsViewPort1.Height / frmPrint.vsViewPort1.Width) Then
    bHeightLimit = True

    Select Case frmPrint.optZoom(0).Value
      Case True                 'full page view
        If bHeightLimit = True Then     'there is a height restriction in the viewport control for this print orientation
          frmPrint.vsPrinter1.Height = frmPrint.vsViewPort1.Height * 0.99
          fTemp = frmPrint.vsPrinter1.PageWidth / frmPrint.vsPrinter1.PageHeight
          fTemp = frmPrint.vsPrinter1.Height * fTemp
          frmPrint.vsPrinter1.Width = fTemp

        Else
          frmPrint.vsPrinter1.Width = frmPrint.vsViewPort1.Width * 0.99
          fTemp = frmPrint.vsPrinter1.PageHeight / frmPrint.vsPrinter1.PageWidth
          fTemp = frmPrint.vsPrinter1.Width * fTemp
          frmPrint.vsPrinter1.Height = fTemp
        End If

        'Make viewport virtual screen large enough to show full page of print control
        frmPrint.vsViewPort1.VirtualWidth = frmPrint.vsPrinter1.Width * 1
        frmPrint.vsViewPort1.VirtualHeight = frmPrint.vsPrinter1.Height * 1
        frmPrint.vsViewPort1.BorderStyle = 1        'turn off border

      Case Else         'Magnify view
        frmPrint.vsPrinter1.Width = frmPrint.vsPrinter1.PageWidth * 1
        frmPrint.vsPrinter1.Height = frmPrint.vsPrinter1.PageHeight * 1
        frmPrint.vsViewPort1.VirtualWidth = frmPrint.vsPrinter1.Width * 1       'ensure scroll bars will be shown
        frmPrint.vsViewPort1.VirtualHeight = frmPrint.vsPrinter1.Height * 1
        frmPrint.vsViewPort1.BorderStyle = 0      'turn on border
    End Select

    frmPrint.vsPrinter1.Visible = True
    frmPrint.vsViewPort1.Visible = True
    frmPrint.vsViewPort1.Refresh
    frmPrint.MousePointer = vbDefault
    DoEvents

End Sub
```

Printing.bas - UpdatePageButtons

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```
Public Sub UpdatePageButtons()
    frmPrint.lblPageNumber.Caption = "Page " + CStr(frmPrint.HScroll1.Value) + " of " + CStr(giTotalPrintPages)
    frmPrint.lblPageNumber.Refresh
    If giTotalPrintPages < 2 Then
        frmPrint.HScroll1.Enabled = False       'no scroll bar needed for a single page
    Else
        frmPrint.HScroll1.Enabled = True
    End If
    DoEvents

End Sub
```

Fax.bas - File Declarations

57

```
Attribute VB_Name = "modFax"
Option Explicit
   Public gcFax As Control
   Public gsFaxFileSpec As String
   Public gsEditName As String      'a temporary place to hold fax names being edited or created
   Public gsEditVoice As String
   Public gsEditFax As String

   Public gsEditGroupIndexes As String    'holds temporary indexes to all locations associated with a group
   Public gsEditGroupName As String

   Type FaxDataStructure
      sFaxID As String
      sDialPrefix As String
      iRetries As Integer
      iRetryInterval As Integer
      bFaxResolution As Byte
      sSenderName As String
      sSenderCompany As String
      sSenderFaxNumber As String
      sSenderVoiceNumber As String

      iLocTotal As Integer          'a count of the locations
      sLocPersonName(100) As String      'rgh it may be desirable in the future to make these arrays dynamic
      sLocFaxNumber(100) As String
      sLocVoiceNumber(100) As String

      iGroupsTotal As Integer
      sGroupTitle(50) As String
      sGroupNamesInTitle(50) As String      'indexes to names separated by pipe.  (ie  3|6|15)

      iGroupLastSelected As Integer
   End Type
   Public FAX_DATA As FaxDataStructure
```

```
Public Sub GetFaxLocations()
   Dim i As Integer, r As Integer, sSection As String

   With FAX_DATA
      sSection = "Fax Locations"
      .iLocTotal = CInt(GetINISetting(gsFaxFileSpec, sSection, "Total Locations", "0"))
      For i = 1 To .iLocTotal
         .sLocPersonName(i) = GetINISetting(gsFaxFileSpec, sSection, "Person " + CStr(i), "")
         .sLocFaxNumber(i) = GetINISetting(gsFaxFileSpec, sSection, "Fax " + CStr(i), "")
         .sLocVoiceNumber(i) = GetINISetting(gsFaxFileSpec, sSection, "Voice " + CStr(i), "")
      Next i

      sSection = "Fax Groups"
      .iGroupsTotal = GetINISetting(gsFaxFileSpec, sSection, "Total Groups", "0")
      For i = 0 To .iGroupsTotal
         .sGroupTitle(i) = GetINISetting(gsFaxFileSpec, sSection, "Group " + CStr(i), "")
         .sGroupNamesInTitle(i) = GetINISetting(gsFaxFileSpec, sSection, "Group Locations " + CStr(i), "")
      Next i

      sSection = "User Selections"
      .iGroupLastSelected = CInt(GetINISetting(gsFaxFileSpec, sSection, "Last Group Selected", "0"))

   End With


End Sub
```

```
Public Function GetIndexToFaxGroupName(ByVal sGroup As String) As Integer
   'Find sName in the list of fax names.  If found, pass index back to caller.
   'otherwise return 0.

   Dim i As Integer
   sGroup = LCase$(sGroup)
   With FAX_DATA
      For i = 1 To .iGroupsTotal
         If LCase$(.sGroupTitle(i)) = sGroup Then
            GetIndexToFaxGroupName = i
     Exit Function
         End If
      Next i
   End With

End Function
```

```
Public Function GetIndexToFaxLocName(ByVal sName As String) As Integer
   'Find sName in the list of fax names.  If found, pass index back to caller.
   'otherwise return 0.

   Dim i As Integer
   sName = LCase$(sName)
   With FAX_DATA
      For i = 1 To .iLocTotal
         If LCase$(.sLocPersonName(i)) = sName Then
            GetIndexToFaxLocName = i
            Exit For
         End If
      Next i
   End With

End Function
```

```
Public Sub RemoveGroupFromFaxList(ByVal sGroup As String)
   'Remove the name from the list and move up all others in the list.
   Dim i As Integer, j As Integer, iIndexFound As Integer

   With FAX_DATA
      For i = 1 To .iGroupsTotal          'look through whole list for name
         If .sGroupTitle(i) = sGroup Then     'found it here
            iIndexFound = i
            Exit For
         End If
      Next i

      For i = iIndexFound To .iGroupsTotal - 1
         .sGroupTitle(i) = .sGroupTitle(i + 1)
         .sGroupNamesInTitle(i) = .sGroupNamesInTitle(i + 1)
      Next i

      .iGroupsTotal = .iGroupsTotal - 1

   End With

End Sub
```

Fax.bas - RemoveNameFromFaxList


```
Public Sub RemoveNameFromFaxList(ByVal sName As String)
    'Remove the name from the list and move up all others in the list.
    Dim i As Integer, j As Integer, iIndexFound As Integer, r As Integer
    Dim sTempList(100) As String, sNewIndexes As String, iTemp As Integer

    With FAX_DATA
        For i = 1 To .iLocTotal             'look through whole list for name
            If .sLocPersonName(i) = sName Then      'found it here
                iIndexFound = i
                Exit For
            End If
        Next i

        For i = iIndexFound To .iLocTotal - 1
            .sLocPersonName(i) = .sLocPersonName(i + 1)
            .sLocVoiceNumber(i) = .sLocVoiceNumber(i + 1)
            .sLocFaxNumber(i) = .sLocFaxNumber(i + 1)
        Next i

        .iLocTotal = .iLocTotal - 1

        'Now that the name has been removed, we must look at all of the indexes of
        'each fax group to see if an index pointer was in there.  If so, it must
        'be removed.  Additionally, all index greater than the one removed must be
        'decremented by one.
        If iIndexFound Then
            For i = 1 To .iGroupsTotal      'look at each index record in a fax group
                'Parse out all of the indexs into a list for easier processing
                r = ParseDelimString(.sGroupNamesInTitle(i), "|", sTempList())
                sNewIndexes = ""
                If r Then 'indexes where found for this record
                    For j = 1 To r
                        'look at each item in the list to see if it equals or great than the one removed
                        iTemp = CInt(sTempList(j))
                        If iTemp = iIndexFound Then      'same index must be removed from list
                            'nothing to do.  Don't add it to new list of indexes

                        ElseIf iTemp > iIndexFound Then      'higher indexes must be decremented by one.
                            iTemp = iTemp - 1
                            sNewIndexes = sNewIndexes + CStr(iTemp) + "|"

                        Else     'original value is OK
                            sNewIndexes = sNewIndexes + CStr(iTemp) + "|"
                        End If
                    Next j
                End If

                .sGroupNamesInTitle(i) = sNewIndexes      'store the new list of indexes back to array
            Next i
        End If
    End With

End Sub
```

Fax.bas - SetFaxDeviceLabel

60

```
Public Sub SetFaxDeviceLabel()
  'This label on the options tab displays the status of the fax device.
  'If a fax device exists, then the label displays the device, otherwise
  'it shows an appropriate message.

  With frmOptions.lblFaxDevice
    If gcFax.DeviceCount > 0 Then       'at least one fax device was found
    '  For i = 0 To gcFax.DeviceCount - 1
      .Caption = gcFax.Devices(0)       'show name of the device found
      .BackColor = &HFF00&              'green background
      .ForeColor = &H0&
    '  Next i

    Else      'no fax devices were found
      .Caption = "A fax device was not found.  Please ensure the fax or modem is connected propery."
      .BackColor = &H80&                'red background
      .ForeColor = &HFFFFFF             'white
    End If
  End With

End Sub
```

Calendar.bas - File Declarations

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```
Attribute VB_Name = "modCalendar"
  Option Explicit

  Private giCompliedDosesCreated As Integer          'number of Complied Doses to show on the calendar
  Private giNonCompliedDosesCreated As Integer       'number of non-complied Doses to show on the calendar
  Private giDoseSizeChangesCreated As Integer
  Private giZoomDosesCreated As Integer              'number of Doses to show in zoom box
  Private giDosesMissedCreated As Integer            'number of objects to show for missed days
  Private gbCalendarUpdateInProgress As Integer      'prevents recursive calls while updating calendar

  Public gsngComplianceTimeRange As Single           '# of hrs on either side of a prescribed dose in which a dose must be taken


  Type CALENDAR_SELECTIONS
    chkDosesTaken As Byte
    chkDosesNotComplied As Byte
    chkDosesMissed As Byte
    chkDoseChanged As Byte
  End Type
  Public CAL_DEFAULTS As CALENDAR_SELECTIONS


  Type SUMMARY_SELECTIONS
    cmboDataToView As Byte
    cmboChartType As Byte
  End Type
  Public PAT_SUM_DEFAULTS As SUMMARY_SELECTIONS
```

Public Function CalcDaysInMonth(ByVal iMonth As Integer, ByVal iYear As Integer)

```
  'Calculate the number of days in the month/year that is passed here
  Dim i As Integer, lTemp As Long

  i = iMonth + 1
  If i = 13 Then i = 1
  lTemp = CVDate(CStr(i) + "/01/" + CStr(iYear))
  lTemp = lTemp - 1
  CalcDaysInMonth = Day(lTemp)
End Function
```

Public Sub DrawAllDoseSizeChanges()

```
  Dim i As Integer, r As Integer, iDaysInMonth As Integer
  Dim sCalendarStartDate As String, dTime As Double
  Dim lDateDifference As Long, lCalendarStartDate  As Long
  Dim bFirstDayAlreadyPlotted As Boolean, bLastDayAlreadyPlotted As Boolean
  RemoveDoseSizeChanges          'remove all of the old doses first

  iDaysInMonth = CalcDaysInMonth(frmDosingCalendar.Calendar.Month, frmDosingCalendar.Calendar.Year)
  sCalendarStartDate = CStr(frmDosingCalendar.Calendar.Month) + "/01/" + Str$(frmDosingCalendar.Calendar.Year)
  lCalendarStartDate = DateValue(sCalendarStartDate)

  If frmDosingCalendar.chkDoseChanged.Value Then
    For i = 1 To PAT_DATA.iEventData(0)      'total number of events
      If PAT_DATA.byteEventType(i) = giEVENT_DOSE_CHANGED Then     'show only med events (not errors, etc)
        lDateDifference = Int(PAT_DATA.dEventDate(i)) - lCalendarStartDate
        If lDateDifference >= 0 And lDateDifference < iDaysInMonth Then
          dTime = PAT_DATA.dEventDate(i) - Int(PAT_DATA.dEventDate(i))
          DrawSingleDoseSizeChange CInt(lDateDifference + 1), dTime, i, True
        End If
      End If
    Next i
  End If

  'This section of code ensures that dosing info is always plotted on the first and
  'last day of the month.
  If bFirstDayAlreadyPlotted = False Then
```

Calendar.bas - DrawAllDoseSizeChanges

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```
        r = FindPrescibedDoseSizeForSpecificDay(PAT_DATA, lCalendarStartDate)
        DrawSingleDoseSizeChange 1, dTime, r, False
    End If

    If bLastDayAlreadyPlotted = False Then
        r = FindPrescibedDoseSizeForSpecificDay(PAT_DATA, lCalendarStartDate + iDaysInMonth - 1)
        DrawSingleDoseSizeChange iDaysInMonth, dTime, r, False
    End If

    For i = 1 To giDoseSizeChangesCreated          'show all the Doses
        frmDosingCalendar.shapeDoseSizeChange(i).Visible = True
    Next i

End Sub
```

```
Public Sub DrawAllCompliedDosesTaken()
    Dim i As Integer, r As Integer
    Dim sCalendarStartDate As String, dTime As Double
    Dim lDateDifference As Long, lCalendarStartDate As Long
    Dim iDayDoseCount As Integer, iDayNumberBeingPlotted As Integer, iLastDoseDayDrawn As Integer
    Dim iDaysInMonth As Integer, lTemp As Long

    RemoveCompliedDosesTaken      'remove all of the old doses first
    If frmDosingCalendar.chkDosesTaken.Value = False Then Exit Sub

    sCalendarStartDate = CStr(frmDosingCalendar.Calendar.Month) + "/01/" + Str$(frmDosingCalendar.Calendar.Year)
    lCalendarStartDate = DateValue(sCalendarStartDate)

    'Calc the number of days in the month being displayed
    iDaysInMonth = CalcDaysInMonth(frmDosingCalendar.Calendar.Month, frmDosingCalendar.Calendar.Year)

    For i = 1 To PAT_DATA.iEventData(0)          'total number of events
        If PAT_DATA.byteEventType(i) = giEVENT_DOSE_TAKEN Then    'show only med events (not errors, etc)
            lDateDifference = Int(PAT_DATA.dEventDate(i)) - lCalendarStartDate
            If lDateDifference >= 0 And lDateDifference < iDaysInMonth Then      'dose occurred during this month
                'Determine if the dose occurred within the compliance parameters
                r = IsDoseWithinPrescribedTimeRange(PAT_DATA, i)     'pass index to event time
                If r Then
                    iDayNumberBeingPlotted = CInt(lDateDifference + 1)
                    If iDayNumberBeingPlotted = iLastDoseDayDrawn Then
                        iDayDoseCount = iDayDoseCount + 1       'plotting same day as last dose
                    Else
                        iDayDoseCount = 1   'this is a new day.  Reset counter
                    End If
                    iLastDoseDayDrawn = iDayNumberBeingPlotted      'remember that we are plotting on this dat
                    DrawSingleCompliedDoseTaken iDayNumberBeingPlotted, dTime, i, iDayDoseCount
                End If
            End If
        End If
    Next i

    For i = 1 To giCompliedDosesCreated          'show all the Doses
        frmDosingCalendar.shapeDose(i).Visible = True
    Next i

End Sub
```

Calendar.bas - DrawAllDosesMissed

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```
Public Sub DrawAllDosesMissed()
  Dim i As Integer, iDaysInMonth As Integer, l As Long
  Dim sCalendarStartDate As String
  Dim lDateDifference As Long, lCalendarStartDate  As Long
  Dim iDayDoseCount As Integer, iDayBeingPlotted As Integer

  RemoveDosesMissed      'remove all of the old doses first
  If frmDosingCalendar.chkDosesMissed.Value = False Then Exit Sub

  iDaysInMonth = CalcDaysInMonth(frmDosingCalendar.Calendar.Month, frmDosingCalendar.Calendar.Year)
  sCalendarStartDate = CStr(frmDosingCalendar.Calendar.Month) + "/01/" + CStr(frmDosingCalendar.Calendar.Year)
  lCalendarStartDate = DateValue(sCalendarStartDate)

  For l = lCalendarStartDate To lCalendarStartDate + iDaysInMonth - 1      'sequence through all days in month
    If l >= PAT_DATA.dEventDate(1) Then   'day being plotted is not earlier than 1st dose in structure
      If l < PAT_DATA.dEventDate(PAT_DATA.iEventData(0)) Then   'day being plotted is not later than last dose in structure
        lDayBeingPlotted = l - lCalendarStartDate + 1              'get the current month day to plot
        iDayDoseCount = CalcDosesSumTakenOnSpecificDay(PAT_DATA, l)      'calc missed doses for this day
        For i = 1 To PAT_DATA.iDosesPerDay - iDayDoseCount
          'DrawSingleDoseMissed iDayBeingPlotted, i          'Plot the current day
        Next i
      End If
    End If
  Next l

  For i = 1 To giDosesMissedCreated                  'show all the Doses
    frmDosingCalendar.shapeDoseMissed(i).Visible = True
  Next i

End Sub
```

```
Public Sub DrawAllNonCompliedDosesTaken()
  Dim i As Integer, j As Integer, bDoseOutOfCompliance As Boolean
  Dim dTimeLimit As Double, dLowLimit As Double, dHighLimit As Double
  Dim sCalendarStartDate As String, dTime As Double
  Dim lDateDifference As Long, lCalendarStartDate  As Long
  Dim lDayDoseCount As Integer, lDayNumberBeingPlotted As Integer, iLastDoseDayDrawn As Integer
  Dim iDaysInMonth As Integer

  RemoveNonCompliedDosesTaken      'remove all of the old doses first
  If frmDosingCalendar.chkDosesNotComplied.Value = False Then Exit Sub

  iDaysInMonth = CalcDaysInMonth(frmDosingCalendar.Calendar.Month, frmDosingCalendar.Calendar.Year)
  sCalendarStartDate = CStr(frmDosingCalendar.Calendar.Month) + "/01/" + Str$(frmDosingCalendar.Calendar.Year)
  lCalendarStartDate = DateValue(sCalendarStartDate)

  dTimeLimit = gsngComplianceTimeRange / 24
  For i = 1 To PAT_DATA.iEventData(0)          'total number of events
    If PAT_DATA.byteEventType(i) = giEVENT_DOSE_TAKEN Then   'show only med events (not errors, etc)
      lDateDifference = Int(PAT_DATA.dEventDate(i)) - lCalendarStartDate
      If lDateDifference >= 0 And lDateDifference <= iDaysInMonth Then      'dose occurred during this month
        dTime = PAT_DATA.dEventDate(i) - Int(PAT_DATA.dEventDate(i))    'get time of dose
        'Determine if the dose occurred within the compliance parameters
        'rgh: see if we can use our procedure already created

        If gsngComplianceTimeRange Then      'do test if there is a value set in the compliance time range
          bDoseOutOfCompliance = True     'set default to be out of range unless otherwise set below
          For j = 1 To PAT_DATA.iDosesPerDay
            'compare dose time against all of the alarm times
            dLowLimit = PAT_DATA.dPrescribedDoseTime(j) - dTimeLimit - 0.0001      'add a factor to prevent rounding error
            dHighLimit = PAT_DATA.dPrescribedDoseTime(j) + dTimeLimit + 0.0001
            If dTime >= dLowLimit And dTime <= dHighLimit Then     'this dose is within compliance
              bDoseOutOfCompliance = False                'set flag to not plot this dose
              Exit For  'no need for further testing of this dose.  It is in compliance
            End If
          Next j
```

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Calendar.bas - DrawAllNonCompliedDosesT(

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```
            Else    'there is no compliance range
              bDoseOutOfCompliance = False
            End If

            If bDoseOutOfCompliance Then
              iDayNumberBeingPlotted = CInt(lDateDifference + 1)
              If iDayNumberBeingPlotted = iLastDoseDayDrawn Then
                iDayDoseCount = iDayDoseCount + 1        'plotting same day as last dose
              Else
                iDayDoseCount = 1   'this is a new day.  Reset counter
              End If
              iLastDoseDayDrawn = iDayNumberBeingPlotted      'remember that we are plotting on this dat

              DrawSingleNonCompliedDoseTaken CInt(lDateDifference + 1), dTime, i, iDayDoseCount
            End If
          End If
        End If
      Next i

      For i = 1 To giNonCompliedDosesCreated                'show all the Doses
        frmDosingCalendar.shapeDoseNonComply(i).Visible = True
      Next i
    End Sub
```

Public Sub DrawSingleDoseSizeChange(iDay As Integer, dTime As Double, iEventNumber As Integer, bHighlig

```
'Draw dosing Doses for the day of the month and time of day passed in here.
'Time of time is expressed in decimal places as a portion of a day (VB time format)
'NOTE:  No checks are currently made to determine whether the event is a med event or
'a non-med event.  If both events are kept in the same array, then a test of the med bit
'must be done before plotting.
'A Dose is not visible when first created.  The caller should display the Doses once they
'are all created, so as to speed the redraw of the screen.
'Create another clone of the the Dose shape located in the array Dose(0)
'When this feature is on, a dose size is automatically entered on the first and last day of the month.

'    On Error Resume Next
Dim i As Integer, iWeekDay As Integer
Dim lDoseLeft As Single, lDoseTop As Single
Dim lTemp As Long, lDayWidth As Long, lDayHeight As Long

giDoseSizeChangesCreated = giDoseSizeChangesCreated + 1                'increment counter
Load frmDosingCalendar.shapeDoseSizeChange(giDoseSizeChangesCreated)          'create a new object
DoEvents
frmDosingCalendar.shapeDoseSizeChange(giDoseSizeChangesCreated) = " " + CStr(PAT_DATA.iEventData(iEventNumber)) + " mg
"
If bHighlight Then
  frmDosingCalendar.shapeDoseSizeChange(giDoseSizeChangesCreated).BackColor = &HFFFFC0          'blue
  frmDosingCalendar.shapeDoseSizeChange(giDoseSizeChangesCreated).ToolTipText = " Dose Size Was Changed Today "
Else
  frmDosingCalendar.shapeDoseSizeChange(giDoseSizeChangesCreated).ToolTipText = " Current Dose Size "
End If

'-------------
'These lines are a work-around for a bug in the control that causes it to
'return the wrong values for day.left, day.top, etc.  When fixed, we can simply use those properties
'and remove these calculations.
lDayWidth = (frmDosingCalendar.Calendar.Width - 50) / 7          'actual scalewidth of a single day
lTemp = (frmDosingCalendar.Calendar.DayLeft(iDay) * 26) / lDayWidth      'approximate location of the day
iWeekDay = CInt(lTemp)
lDoseLeft = (iWeekDay * lDayWidth)     'get left edge of day to plot
'lDoseLeft = lDoseLeft + ((lDayWidth / 5) * iPlotPosition - 1) - (lDayWidth / 10)
lDoseLeft = lDoseLeft + (lDayWidth * 0.8) - frmDosingCalendar.shapeDoseSizeChange(giDoseSizeChangesCreated).Width

'-------------
If Int(lDayWidth / 150) < 7 Then
  frmDosingCalendar.shapeDoseSizeChange(giDoseSizeChangesCreated).FontBold = False
Else
```

```
    frmDosingCalendar.shapeDoseSizeChange(giDoseSizeChangesCreated).FontBold = True
End If

frmDosingCalendar.shapeDoseSizeChange(giDoseSizeChangesCreated).FontSize = Int(lDayWidth / 150)
frmDosingCalendar.shapeDoseSizeChange(giDoseSizeChangesCreated).Left = lDoseLeft

'-----------------
'These lines are a work-around for a bug in the control that causes it to
'return the wrong values for day.left, day.top, etc.  When fixed, we can simply use those properties
'and remove these calculations.
'The control is even moe stupid than I first supected.  It can not always return the proper vertical
'location of a day, thus, we have to jump through more hoops to figure out what week that a particular
'day is in.
lDayHeight = (frmDosingCalendar.Calendar.Height - 50) - 625      'an offset is used to compensate for height of title
lDayHeight = lDayHeight / 6
iWeekDay = (frmDosingCalendar.Calendar.DayLeft(1) * 26) / lDayWidth      'the approximate location of the day
lTemp = Int((lDay + iWeekDay - 1) / 7)
'-----------------
lDoseTop = (lTemp * lDayHeight) + 625      'this number factors in the title bar
lDoseTop = lDoseTop + 50
frmDosingCalendar.shapeDoseSizeChange(giDoseSizeChangesCreated).Top = lDoseTop
frmDosingCalendar.shapeDoseSizeChange(giDoseSizeChangesCreated).Tag = iEventNumber      'keep event number for updating the
zoom box

'   On Error GoTo 0

End Sub
```

```
Private Sub DrawSingleNonCompliedDoseTaken(iDay As Integer, dTime As Double, iEventNumber As
Integer, iPlotPosition As Integer)
'Draw dosing Doses for the day of the month and time of day passed in here.
'Time of time is expressed in decimal places as a portion of a day (VB time format)
'NOTE:  No checks are currently made to determine whether the event is a med event or
'a non-med event.  If both events are kept in the same array, then a test of the med bit
'must be done before plotting.
'A Dose is not visible when first created.  The caller should display the Doses once they
'are all created, so as to speed the redraw of the screen.
'Create another clone of the the Dose shape located in the array Dose(0)
On Error Resume Next
Dim i As Integer, iWeekDay As Integer
Dim lDoseLeft As Single, lDoseTop As Single
Dim lTemp As Long, lDayWidth As Long, lDayHeight As Long

giNonCompliedDosesCreated = giNonCompliedDosesCreated + 1      'increment Dose counter
Load frmDosingCalendar.shapeDoseNonComply(giNonCompliedDosesCreated)      'create a new Dose

'-----------------
'These lines are a work-around for a bug in the control that causes it to
'return the wrong values for day.left, day.top, etc.  When fixed, we can simply use those properties
'and remove these calculations.
lDayWidth = (frmDosingCalendar.Calendar.Width - 50) / 7      'actual scalewidth of a single day
iWeekDay = (frmDosingCalendar.Calendar.DayLeft(iDay) * 26) / lDayWidth      'approximate location of the day
'-----------------

lDoseLeft = (iWeekDay * lDayWidth)      'get left edge of day to plot
lDoseLeft = lDoseLeft + ((lDayWidth / 5) * iPlotPosition - 1) - (lDayWidth / 10)
frmDosingCalendar.shapeDoseNonComply(giNonCompliedDosesCreated).Left = lDoseLeft


'-----------------
'These lines are a work-around for a bug in the control that causes it to
'return the wrong values for day.left, day.top, etc.  When fixed, we can simply use those properties
'and remove these calculations.
'The control is even moe stupid than I first supected.  It can not always return the proper vertical
'location of a day, thus, we have to jump through more hoops to figure out what week that a particular
'day is in.
lDayHeight = (frmDosingCalendar.Calendar.Height - 50) - 625      'an offset is used to compensate for height of title
```

Calendar.bas - DrawSingleNonCompliedDose


```
    lDayHeight = lDayHeight / 6
    iWeekDay = (frmDosingCalendar.Calendar.DayLeft(1) * 26) / lDayWidth          'the approximate location of the day
    lTemp = Int((iDay + iWeekDay - 1) / 7)
    '-----------------

    lDoseTop = (lTemp * lDayHeight) + 625      'this number factors in the title bar
    lDoseTop = lDoseTop + lDayHeight - 50 - frmDosingCalendar.shapeDose(0).Height - frmDosingCalendar.shapeDoseNonComply(0).
    Height    'draw in middle of day
    frmDosingCalendar.shapeDoseNonComply(giNonCompliedDosesCreated).Top = lDoseTop

    frmDosingCalendar.shapeDoseNonComply(giNonCompliedDosesCreated).Tag = iEventNumber          'keep event number for updating the
    zoom box

    On Error GoTo 0
End Sub
```

Public Function IsDoseWithinPrescribedTimeRange(DataStruct As DeviceDataStruct, ByVal iIndex As Integer)

```
    'Test to see that the event at the index passed here is a medication event and that
    'it is within the prescribed time range for a daily dose.  If yes, then
    'pass TRUE back to the caller.
    Dim i As Integer, dTime As Double
    Dim dTimeLimit As Double, dLowLimit As Double, dHighLimit As Double

    dTimeLimit = gsngComplianceTimeRange / 24
    dTime = DataStruct.dEventDate(iIndex) - Int(DataStruct.dEventDate(iIndex))      'get time of dose
    If gsngComplianceTimeRange Then
        For i = 1 To DataStruct.iDosesPerDay
            'compare dose time against all of the alarm times
            dLowLimit = DataStruct.dPrescribedDoseTime(i) - dTimeLimit - 0.0001      'add a factor to prevent rounding error
            dHighLimit = DataStruct.dPrescribedDoseTime(i) + dTimeLimit + 0.0001
            If dTime >= dLowLimit And dTime <= dHighLimit Then
                IsDoseWithinPrescribedTimeRange = True
                Exit For  'no need to do any further testing for this dose
            End If
        Next i
    Else      'there is no compliance range, so pass back a success flag
        IsDoseWithinPrescribedTimeRange = True
    End If
End Function
```

Private Sub PrintCalendar()

```
'' This routine is called when the user presses the print button
'' on the calendar form
'
' Dim sPrintInfo As String
' Dim CRLF As String
' Dim bcolorCalendar As Long
' Dim bcolorpnlZoom As Long
' Dim bcolorpnlTime As Long
' Dim bcolorForm As Long
' Dim fcolorPrescribed As Long
' Dim fcolorMissed As Long
' Dim fcolorWeek As Long
'
' Dim curTop As Long
' Dim curWidth As Integer
' Dim curHeight As Integer
'
' Const XOffset = 1920
' Const YOffset = 1890
'
' On Error GoTo Error_btnPrint
'
'
' CRLF = Chr$(13) + Chr$(10)
'
```

Calendar.bas - PrintCalendar


```
'
'   curTop = Me.Top
'   curWidth = Me.Width
'   curHeight = Me.Height
'
'   ' Hide this guy off the screen while we print
'   Me.Top = -(curHeight * 2)
'
'   '  Save current background colors
'   bcolorCalendar = Calendar.BackColor
'   bcolorpnlZoom = pnlZoom.BackColor
'   bcolorpnlTime = pnlTime.BackColor
'   bcolorForm = Me.BackColor
'   fcolorPrescribed = chkDosesTaken.FillColor
'   fcolorMissed = chkDosesMissed.FillColor
'   fcolorWeek = chkWeekNumbers.FillColor
'
'   ' hide the buttons
'   btnClose.Visible = False
'   btnPrint.Visible = False
'
'   '  Add date + time info to printed data
'   sPrintInfo = "Printed on: " + Format$(Now, "dddddd hh:nn")
'   lblPrntInfo.Caption = sPrintInfo
'
'   '  Set titles at top of printed page
'   lblTitle.Caption = "Dosing Calendar"
'   lblPatient.Caption = "Patient: " + tgDevicestat.sPatient
'   lbldrug.Caption = "Drug: " + tgDevicestat.sDrug
'
'   '  Set background colors
'   Calendar.BackColor = WHITE
'   pnlZoom.BackColor = WHITE
'   pnlTime.BackColor = WHITE
'   Me.BackColor = WHITE
'   chkDosesTaken.FillColor = WHITE
'   chkDosesMissed.FillColor = WHITE
'   chkWeekNumbers.FillColor = WHITE
'
'   '  Let user know we are printing
'   Load frm_Status
'   frm_Status.lblStatus.Caption = "Preparing to print calendar"
'   frm_Status.Show
'
'   '  Move resize the form and move objects to give space for printing
'   Call DeleteAllObjects          ' remove extraneous elements from calendar
'   Call MoveFormObjects(Me, XOffset, YOffset, True)
'   Call UpdateCalendar
'   DoEvents
'
'   'Call UpdateZoomBox
'
'   '  Switch on visibility of titles
'   lblPrintInfo.Visible = True
'   lblTitle.Visible = True
'   lblPatient.Visible = True
'   lbldrug.Visible = True
'
'   '  Make Check boxes two dimensional
'   chkDosesTaken.CheckBox2d = True
'   chkDosesMissed.CheckBox2d = True
'   chkWeekNumbers.CheckBox2d = True
'
'
'   ' Bring the Zoom lables to the front
'   lblZoomTime.ZOrder 0
'   lblZoomTime.Visible = True
'
'   ' Print the form
```

Calendar.bas - PrintCalendar

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```
'
'   Me.Height = Me.Height + YOffset
'   Me.Width = Me.Width + XOffset
'
'   DoEvents
'   Me.PrintForm
'   DoEvents
'
'
'   frm_Status.lblStatus.Caption = "Sending calendar to printer"
'
'   ' hide the titles and show the buttons
'   lblPrintInfo.Visible = False
'   lblTitle.Visible = False
```

Calendar.bas - PrintCalendar


```
'    lblPatient.Visible = False
'    lbldrug.Visible = False
'
'    ' Move everything back
'    Call DeleteAllObjects
'    Call MoveFormObjects(Me, -XOffset, -YOffset, True)
'    Call UpdateCalendar
'
'    ' Restore background colors
'    Calendar.BackColor = bcolorCalendar
'    pnlZoom.BackColor = bcolorpnlZoom
'    pnlTime.BackColor = bcolorpnlTime
'    Me.BackColor = bcolorForm
'    chkDosesTaken.FillColor = fcolorPrescribed
'    chkDosesMissed.FillColor = fcolorMissed
'    chkWeekNumbers.FillColor = fcolorWeek
'
'    ' Restore buttons
'    btnClose.Visible = True
'    btnPrint.Visible = True
'
'    ' Set check boxes back to 3d
'    ' Make Check boxes two dimensional
'    chkDosesTaken.CheckBox2d = False
'    chkDosesMissed.CheckBox2d = False
'    chkWeekNumbers.CheckBox2d = False
'
'    ' Bring box back into view
'    Me.Width = curWidth
'    Me.Height = curHeight
'    Me.Top = curTop        ' bring form back into view
'
'    Unload frm_Status
'
'Exit_btnPrint:
'    Exit Sub
'
'
'
'Error_btnPrint:
'    Resume Exit_btnPrint
```

```
End Sub

Public Sub RemoveDoseSizeChanges()
  Dim i As Integer
  On Error Resume Next

  For i = 1 To giDoseSizeChangesCreated          'remove all previous Doses
    Unload frmDosingCalendar.shapeDoseSizeChange(i)
  Next i
  giDoseSizeChangesCreated = 0

  On Error GoTo 0
End Sub

Public Sub RemoveDosesMissed()
  Dim i As Integer
  On Error Resume Next

  For i = 1 To giDosesMissedCreated              'remove all previous objects
    Unload frmDosingCalendar.shapeDoseMissed(i)
  Next i
  giDosesMissedCreated = 0

  On Error GoTo 0
End Sub

Public Sub RemoveCompliedDosesTaken()
  Dim i As Integer
  On Error Resume Next

  For i = 1 To giCompliedDosesCreated            'remove all previous Doses
    Unload frmDosingCalendar.shapeDose(i)
  Next i
  giCompliedDosesCreated = 0
  On Error GoTo 0
End Sub

Public Sub RemoveNonCompliedDosesTaken()
  Dim i As Integer
  On Error Resume Next

  For i = 1 To giNonCompliedDosesCreated         'remove all previous Doses
    Unload frmDosingCalendar.shapeDoseNonComply(i)
  Next i
  giNonCompliedDosesCreated = 0

  On Error GoTo 0
End Sub
```

Calendar.bas - UpdateZoomBox


```
Public Sub UpdateZoomBox()
  'A different day was clicked on the calendar, so we need to plot the events for
  'the current day into the zoom box.
  'This procedure draws doses taken for a given day
  'NOTE:  No checks are currently made to determine whether the event is a med event or
  'a non-med event.  If both events are kept in the same array, then a test of the med bit
  'must be done before plotting.

  Dim i As Integer, dTime As Double, iDoseDay As Integer, iZoomPanelWidth As Integer
  Static bProcedureInProgress
  If bProcedureInProgress Then Exit Sub
  bProcedureInProgress = True

  On Error Resume Next                    'prevent error if already unloaded
  For i = 1 To giZoomDosesCreated         'remove all previous Doses
    Unload frmDosingCalendar.shapeZoomDose(i)
  Next i
  giZoomDosesCreated = 0

  For i = 1 To 4
    Unload frmDosingCalendar.shapeZoomPrescribed(i)     'clear the text box for zoom time
    Unload frmDosingCalendar.shapeZoomTimeRange(i)      'clear the text box for zoom time
  Next i

  On Error GoTo 0                         'resume normal error status

  iZoomPanelWidth = frmDosingCalendar.pnlZoom.Width     'speed up process by defining width from control
  For i = 1 To 4
    If PAT_DATA.dPrescribedDoseTime(i) >= 0 Then
      dTime = PAT_DATA.dPrescribedDoseTime(i) - Int(PAT_DATA.dPrescribedDoseTime(i))
      Load frmDosingCalendar.shapeZoomTimeRange(i)
      frmDosingCalendar.shapeZoomTimeRange(i).Left = (iZoomPanelWidth * dTime) - (iZoomPanelWidth * (
       gsngComplianceTimeRange / 24))
      frmDosingCalendar.shapeZoomTimeRange(i).Width = (iZoomPanelWidth * (gsngComplianceTimeRange / 24) * 2)
      'frmDosingCalendar.shapeZoomTimeRange(i).ToolTipText = " Compliance Time Range = +- " + CStr(gsngComplianceTimeRange
       ) + " Hrs."
      frmDosingCalendar.shapeZoomTimeRange(i).Visible = True
      frmDosingCalendar.shapeZoomTimeRange(i).ZOrder
    End If
  Next i

  For i = 1 To 4
    If PAT_DATA.dPrescribedDoseTime(i) >= 0 Then
      dTime = PAT_DATA.dPrescribedDoseTime(i) - Int(PAT_DATA.dPrescribedDoseTime(i))
      Load frmDosingCalendar.shapeZoomPrescribed(i)
      frmDosingCalendar.shapeZoomPrescribed(i).Left = (iZoomPanelWidth * dTime) - (frmDosingCalendar.shapeZoomPrescribed(i).
       Width / 2) + 15
      frmDosingCalendar.shapeZoomPrescribed(i).ToolTipText = Format$(dTime, gsTimeDisplayFormat)
      frmDosingCalendar.shapeZoomPrescribed(i).Visible = True
      frmDosingCalendar.shapeZoomPrescribed(i).ZOrder
    End If
  Next i

'  For i = 1 To 4
'    frmDosingCalendar.txtZoomTime(i).Caption = ""       'clear the text box for zoom time
'  Next i

  Dim lCalendarDate As Long
  lCalendarDate = DateValue(frmDosingCalendar.Calendar.Date)
  For i = 1 To giCompliedDosesCreated
    'rgh we may later want to use a global array instead of the tag property to prevent flashing and speed things up.
    iDoseDay = frmDosingCalendar.shapeDose(i).Tag       'get the day that the dose was taken on
    If Int(PAT_DATA.dEventDate(iDoseDay)) = lCalendarDate Then
      'Create another clone of the the Dose shape located in the array Dose(0)
      giZoomDosesCreated = giZoomDosesCreated + 1       'increment Dose counter
```

Calendar.bas - UpdateZoomBox


```
            Load frmDosingCalendar.shapeZoomDose(giZoomDosesCreated)          'create a new Dose
            dTime = PAT_DATA.dEventDate(iDoseDay) - Int(PAT_DATA.dEventDate(iDoseDay))
            frmDosingCalendar.shapeZoomDose(giZoomDosesCreated).Left = (frmDosingCalendar.pnlZoom.Width * dTime) - (
            frmDosingCalendar.shapeZoomDose(giZoomDosesCreated).Width / 2)
            frmDosingCalendar.shapeZoomDose(giZoomDosesCreated).ToolTipText = Format$(dTime, gsTimeDisplayFormat)
            frmDosingCalendar.shapeZoomDose(giZoomDosesCreated).Visible = True
            frmDosingCalendar.shapeZoomDose(giZoomDosesCreated).ZOrder
        End If
    Next i


    For i = 1 To giNonCompliedDosesCreated
        iDoseDay = frmDosingCalendar.shapeDoseNonComply(i).Tag          'get the day that the dose was taken on
        If Int(PAT_DATA.dEventDate(iDoseDay)) = ICalendarDate Then
            'Create another clone of the the Dose shape located in the array Dose(0)
            giZoomDosesCreated = giZoomDosesCreated + 1                 'increment Dose counter
            Load frmDosingCalendar.shapeZoomDose(giZoomDosesCreated)          'create a new Dose
            dTime = PAT_DATA.dEventDate(iDoseDay) - Int(PAT_DATA.dEventDate(iDoseDay))
            frmDosingCalendar.shapeZoomDose(giZoomDosesCreated).Left = (frmDosingCalendar.pnlZoom.Width * dTime) - (
            frmDosingCalendar.shapeZoomDose(giZoomDosesCreated).Width / 2)
            frmDosingCalendar.shapeZoomDose(giZoomDosesCreated).ToolTipText = Format$(dTime, gsTimeDisplayFormat)
            frmDosingCalendar.shapeZoomDose(giZoomDosesCreated).Visible = True
            frmDosingCalendar.shapeZoomDose(giZoomDosesCreated).ZOrder
        End If
    Next i

    frmDosingCalendar.pnlZoom.Caption = Format$(frmDosingCalendar.Calendar.Date, "General Date") + " Detail View"

    'update position of time scale
    For i = 2 To 22 Step 2
        frmDosingCalendar.lblDetailTime(i).Left = (frmDosingCalendar.pnlZoom.Width * (i / 24)) - (frmDosingCalendar.lblDetailTime(i).Width
        / 2)
    Next i
    frmDosingCalendar.shapeDayLight(2).Width = frmDosingCalendar.pnlZoom.Width * 0.53
    frmDosingCalendar.shapeDayLight(1).Width = frmDosingCalendar.pnlZoom.Width * 0.03
    frmDosingCalendar.shapeDayLight(3).Width = frmDosingCalendar.shapeDayLight(1).Width
    frmDosingCalendar.shapeDayLight(2).Left = (frmDosingCalendar.pnlZoom.Width - frmDosingCalendar.shapeDayLight(2).Width) / 1.8
    frmDosingCalendar.shapeDayLight(1).Left = 20 + frmDosingCalendar.shapeDayLight(2).Left - frmDosingCalendar.shapeDayLight(1).
    Width
    frmDosingCalendar.shapeDayLight(3).Left = frmDosingCalendar.shapeDayLight(2).Left + frmDosingCalendar.shapeDayLight(2).Width
    - 15

    bProcedureInProgress = False

End Sub
```

Private Sub MoveFormObjects(frm As Form, XOffset As Integer, YOffset As Integer, VisibleOnly As Integer)

```
    ' This routine moves all objects on a form by the specifed amount
    ' Argument      Description
    ' frm           Form object
    ' XOffset       offset (in twips) to move in x plane.  Positive is to the right
    ' YOffset       offset (in twips) to move in y plane.  Positive is down.
    ' VisibleOnly   If true only move visible objects
    Dim i As Integer
    On Error GoTo Error_MoveFormObjects

    ' loop through all the forms on the form
    For i = 0 To frm.Controls.Count - 1
        ' if 1) the processing only visible controls and the controls is visible
        '  or 2) processing all controls
        If frm.Controls(i).Tag <> "contained" Then
            If (VisibleOnly And frm.Controls(i).Visible) Or Not VisibleOnly Then
                ' reset left and top properties
                frm.Controls(i).Left = frm.Controls(i).Left + XOffset
                frm.Controls(i).Top = frm.Controls(i).Top + YOffset
            End If
        End If
    Next i
```

```
Exit_MoveFormObjects:
    Exit Sub

Error_MoveFormObjects:
    Resume Exit_MoveFormObjects

End Sub
```

```
Private Sub DrawSingleCompliedDoseTaken(iDay As Integer, dTime As Double, iEventNumber As Integer, iPlo
    'Draw dosing Doses for the day of the month and time of day passed in here.
    'Time is expressed in decimal places as a portion of a day (VB time format)
    'NOTE:  No checks are currently made to determine whether the event is a med event or
    'a non-med event.  If both events are kept in the same array, then a test of the med bit
    'must be done before plotting.
    'A Dose is not visible when first created.  The caller should display the Doses once they
    'are all created, so as to speed the redraw of the screen.
    'Create another clone of the the Dose shape located in the array Dose(0)
    On Error Resume Next
    Dim i As Integer, iWeekDay As Integer
    Dim lDoseLeft As Single, lDoseTop As Single
    Dim lTemp As Long, lDayWidth As Long, lDayHeight As Long

    giCompliedDosesCreated = giCompliedDosesCreated + 1              'increment Dose counter
    Load frmDosingCalendar.shapeDose(giCompliedDosesCreated)         'create a new Dose

    '-----------------
    'These lines are a work-around for a bug in the control that causes it to
    'return the wrong values for day.left, day.top, etc.  When fixed, we can simply use those properties
    'and remove these calculations.
    lDayWidth = (frmDosingCalendar.Calendar.Width - 50) / 7           'actual scalewidth of a single day
    iWeekDay = (frmDosingCalendar.Calendar.DayLeft(iDay) * 26) / lDayWidth       'approximate location of the day
    '-----------------

    lDoseLeft = (iWeekDay * lDayWidth)     'get left edge of day to plot
    lDoseLeft = lDoseLeft + ((lDayWidth / 5) * iPlotPosition - 1) - (lDayWidth / 10)
    frmDosingCalendar.shapeDose(giCompliedDosesCreated).Left = lDoseLeft


    '-----------------
    'These lines are a work-around for a bug in the control that causes it to
    'return the wrong values for day.left, day.top, etc.  When fixed, we can simply use those properties
    'and remove these calculations.
    'The control is even moe stupid than I first supected.  It can not always return the proper vertical
    'location of a day, thus, we have to jump through more hoops to figure out what week that a particular
    'day is in.
    lDayHeight = (frmDosingCalendar.Calendar.Height - 50) - 625       'an offset is used to compensate for height of title
    lDayHeight = lDayHeight / 6
    iWeekDay = (frmDosingCalendar.Calendar.DayLeft(1) * 26) / lDayWidth       'the approximate location of the day
    lTemp = Int((iDay + iWeekDay - 1) / 7)
    '-----------------

    lDoseTop = (lTemp * lDayHeight) + 625     'this number factors in the title bar
    lDoseTop = lDoseTop + lDayHeight - 25 - frmDosingCalendar.shapeDose(0).Height       'draw in bottom of day
    frmDosingCalendar.shapeDose(giCompliedDosesCreated).Top = lDoseTop
    frmDosingCalendar.shapeDose(giCompliedDosesCreated).Tag = iEventNumber       'keep event number for updating the zoom box

    On Error GoTo 0
End Sub
```

Calendar.bas - DrawSingleDoseMissed


```
Private Sub DrawSingleDoseMissed(iDay As Integer, iPlotPosition As Integer)
    'Draw doses for the day of the month passed in here
    'NOTE:  No checks are currently made to determine whether the event is a med event or
    'a non-med event.  A test of the med bit must be done before calling this procedure.
    'A Dose is not visible when first created  The caller should display the Doses once they
    'are all created. so as to speed the redraw of the screen.

    On Error Resume Next
    Dim i As Integer, iWeekDay As Integer
    Dim lDoseLeft As Single, lDoseTop As Single
    Dim lTemp As Long, lDayWidth As Long, lDayHeight As Long

    giDosesMissedCreated = giDosesMissedCreated + 1                    'increment Dose counter
    'Create another clone of the the Dose shape located in the array Dose(0)
    Load frmDosingCalendar.shapeDoseMissed(giDosesMissedCreated)       'create a new Dose

    '-----------------
    'These lines are a work-around for a bug in the control that causes it to
    'return the wrong values for day.left, day.top, etc.  When fixed, we can simply use those properties
    'and remove these calculations.
    lDayWidth = (frmDosingCalendar.Calendar.Width - 50) / 7            'actual scalewidth of a single day
    iWeekDay = (frmDosingCalendar.Calendar.DayLeft(iDay) * 26) / lDayWidth    'approximate location of the day
    '-----------------

    lDoseLeft = (iWeekDay * lDayWidth)     'get left edge of day to plot
    lDoseLeft = lDoseLeft + ((lDayWidth / 5) * iPlotPosition - 1) - (lDayWidth / 10)
    frmDosingCalendar.shapeDoseMissed(giDosesMissedCreated).Left = lDoseLeft


    '-----------------
    'These lines are a work-around for a bug in the control that causes it to
    'return the wrong values for day.left, day.top, etc.  When fixed, we can simply use those properties
    'and remove these calculations.
    'The control is even moe stupid than I first supected.  It can not always return the proper vertical
    'location of a day, thus, we have to jump through more hoops to figure out what week that a particular
    'day is in.
    lDayHeight = (frmDosingCalendar.Calendar.Height - 50) - 625        'an offset is used to compensate for height of title
    lDayHeight = lDayHeight / 6
    iWeekDay = (frmDosingCalendar.Calendar.DayLeft(1) * 26) / lDayWidth        'the approximate location of the day
    lTemp = Int((lDay + iWeekDay - 1) / 7)
    '-----------------

    lDoseTop = (lTemp * lDayHeight) + 625     'this number factors in the title bar
    lDoseTop = lDoseTop + lDayHeight - 75 - frmDosingCalendar.shapeDose(0).Height - frmDosingCalendar.shapeDose(0).Height -
    ↳ frmDosingCalendar.shapeDose(0).Height     'draw in bottom of day
    frmDosingCalendar.shapeDoseMissed(giDosesMissedCreated).Top = lDoseTop

    On Error GoTo 0
End Sub
```

```
Public Sub UpdateCalendar()
    'The month or year fo the calendar has changed, so we need to plot the events for
    'the current month and year being shown.

    Static bProcedureInProgress As Boolean
    If bProcedureInProgress Then Exit Sub
    bProcedureInProgress = True

    Dim iObjectDiameter As Integer

    'Show custom labels from config file if there were any
    If Len(gsCustomLblPatientLastName) > 0 Then frmDosingCalendar.Label1 = gsCustomLblPatientLastName
    frmDosingCalendar.lblPatientName = " " + PAT_DATA.sPatientLastName + ", " + PAT_DATA.sPatientFirstName

    iObjectDiameter = frmDosingCalendar.Calendar.Width / 45        'resize the objects drawn on the calendar
    If iObjectDiameter > frmDosingCalendar.Calendar.Height / 50 Then iObjectDiameter = frmDosingCalendar.Calendar.Height / 50
```

```
    frmDosingCalendar.shapeDose(0).Width = iObjectDiameter
    frmDosingCalendar.shapeDose(0).Height = iObjectDiameter
    frmDosingCalendar.shapeDoseNonComply(0).Width = iObjectDiameter
    frmDosingCalendar.shapeDoseNonComply(0).Height = iObjectDiameter
    frmDosingCalendar.shapeDoseMissed(0).Width = iObjectDiameter
    frmDosingCalendar.shapeDoseMissed(0).Height = iObjectDiameter
'   frmDosingCalendar.shapeDoseSizeChange(0).Width = iObjectDiameter
'   frmDosingCalendar.shapeDoseSizeChange(0).Height = iObjectDiameter

    DrawAllCompliedDosesTaken
    DrawAllNonCompliedDosesTaken
    DrawAllDosesMissed
    DrawAllDoseSizeChanges

    UpdateZoomBox

    bProcedureInProgress = False
End Sub
```

```
Public Sub RemoveAllObjects()
    'Remove all objects from calendar
    RemoveCompliedDosesTaken
    RemoveDosesMissed
    DoEvents
End Sub
```

frmMain.frm - File Declarations

76

```
Attribute VB_Name = "frmMain"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = False
Attribute VB_PredeclaredId = True
Attribute VB_Exposed = False
Option Explicit

Private Sub CommTimer_Timer()
  gbCommTimerExpired = True
  CommTimer.Enabled = False
End Sub

Private Sub FaxMan1_ConfigurationDone()
  Dim i As Integer
  frmOptions.MousePointer = vbDefault
  frmOptions.btnConfigureFax.Enabled = True
  SetFaxDeviceLabel
End Sub

Private Sub FaxMan1_FaxStatus(Device As Integer, Status As Integer)
  Beep
  If gcFax.Status(Device) = "Initializing Modem" Or gcFax.Status(Device) = "Answering" Then
    frmFaxStatus.Show
  ElseIf gcFax.Status(Device) = "Port Closed" Then
    Unload frmFaxStatus
  End If

  frmFaxStatus.lblRemoteID = gcFax.StatusRemoteID(Device)

  If gcFax.StatusConnectSpeed(Device) > 0 Then
    frmFaxStatus.lblSpeed = gcFax.StatusConnectSpeed(Device)
  Else
    frmFaxStatus.lblSpeed = ""
  End If

  If gcFax.StatusPages(Device) Then
    frmFaxStatus.lblPage = CStr(gcFax.StatusPagesSent(Device)) + " of " + Str$(gcFax.StatusPages(Device))
  Else
    frmFaxStatus.lblPage = CStr(gcFax.StatusPagesSent(Device))
  End If

  If gcFax.StatusPercentage(Device) > 0 Then
    frmFaxStatus.lblPercent = CStr(gcFax.StatusPercentage(Device)) + " % Complete"
  Else
    frmFaxStatus.lblPercent = ""
  End If

  frmFaxStatus.lblStatus = gcFax.Status(Device)
  frmFaxStatus.lblDestination = gcFax.StatusDestination(Device)
  frmFaxStatus.lblFaxNumber = gcFax.StatusNumber(Device)
End Sub
```

frmMain.frm - MDIForm_Load

77

```
Private Sub MDIForm_Load()
    On Error Resume Next
    Me.Left = CLng(GetINISetting(gsAppIniFileSpec, "Windows", "Main Left", "1000"))
    Me.Top = CLng(GetINISetting(gsAppIniFileSpec, "Windows", "Main Top", "1000"))
    Me.Width = CLng(GetINISetting(gsAppIniFileSpec, "Windows", "Main Width", "6500"))
    Me.Height = CLng(GetINISetting(gsAppIniFileSpec, "Windows", "Main Height", "6500"))
'   Me.WindowState = CLng(GetINISetting(gsAppIniFileSpec, "Windows", "Main WindowState", "0"))
    On Error GoTo 0
End Sub
```

```
Private Sub MDIForm_Unload(Cancel As Integer)
    Dim r As Integer

    r = ValidatePatientDataSaved    'make sure any device data has first been saved
    'Save Window positions
    If Me.WindowState <> vbMinimized Then
        SaveINISetting gsAppIniFileSpec, "Windows", "Main Left", CStr(Me.Left)
        SaveINISetting gsAppIniFileSpec, "Windows", "Main Top", CStr(Me.Top)
        SaveINISetting gsAppIniFileSpec, "Windows", "Main Width", CStr(Me.Width)
        SaveINISetting gsAppIniFileSpec, "Windows", "Main Height", CStr(Me.Height)
        SaveINISetting gsAppIniFileSpec, "Windows", "Main WindowState", CStr(Me.WindowState)
    End If

    SaveProgramPreferences
End Sub
```

```
Private Sub mnuAccessWebSite_Click()
    'if the form is minimized then set it back to normal
    Call LogonToWebSite
    If frmBrowser.WindowState = vbMinimized Then
        frmBrowser.WindowState = vbNormal
    End If
    frmBrowser.ZOrder
End Sub
```

```
Private Sub mnuFaxConfigure_Click()
    giLatestOptionsTabSelected = 2      'display the fax tab once the dialog is opened
    frmOptions.Show vbModal
End Sub
```

```
Private Sub mnuFaxSend_Click()
    frmFaxSend.Show
End Sub
```

```
Private Sub mnuFaxViewLogs_Click()
    frmFaxLog.Show
End Sub
```

```
Private Sub mnuFileProperties_Click()
    frmOptions.Show vbModal
End Sub

Private Sub mnuFileSave_Click()
    Dim r As Integer

    If PAT_DATA.sPatientDataFileName = "" Then
        r = SaveDataToNewFile
    Else
        r = SavePatientData(PAT_DATA.sPatientDataFileName)
    End If

    If r = False Then
        Beep
        MsgBox "An error occurred while attempting to save the data file.  It was not saved.", vbCritical, "File Not Saved"
    End If
End Sub

Private Sub mnuGenError_Click()
    MsgBox "This is a temporary test error handler.  When you click OK, a synthethic error (Divide by 0) will be generated.  The same dialog
    ↳ will be shown when any error is generated.  It generates a log file that provides valuable information for the developer.  This will be
    ↳ removed from the next build.", vbInformation, "Test Error Handler"
    Error 11
End Sub

Private Sub mnuHelpDeviceDiag_Click()
    Dim sMSG, sReply As String
    sMSG = "Performing a device diagnostics test could cause loss of vital device information and should be done only with the assistance
    ↳ of technical support."
    sMSG = sMSG + vbCrLf + vbCrLf + "Please contact our technical support department at 1-800-???-???? for a password and assistance
    ↳ ."

    ' Display message, title, and default value.
    sReply = InputBox(sMSG, "Password Required")
    If LCase$(sReply) = "h2o" Then frmDeviceDiagnostics.Show
End Sub

Private Sub mnuHelpTips_Click()
    frmTip.Show
    'if the form is minimized then set it back to normal
    If frmTip.WindowState = vbMinimized Then frmTip.WindowState = vbNormal
    frmTip.ZOrder
End Sub
```

```
Private Sub mnuReadDeviceData_Click()
   frmReadDeviceData.Show
   'if the form is minimized then set it back to normal
   If frmReadDeviceData.WindowState = vbMinimized Then frmReadDeviceData.WindowState = vbNormal
   frmReadDeviceData.ZOrder
End Sub
```

```
Private Sub mnuSendDeviceData_Click()
   frmDeviceInitialize.Show
   'if the form is minimized then set it back to normal
   If frmDeviceInitialize.WindowState = vbMinimized Then frmDeviceInitialize.WindowState = vbNormal
   frmDeviceInitialize.ZOrder
End Sub
```

```
Private Sub mnuViewAllPatients_Click()
   frmAllPatients.Show
   'if the form is minimized then set it back to normal
   If frmAllPatients.WindowState = vbMinimized Then frmAllPatients.WindowState = vbNormal
   frmAllPatients.ZOrder
End Sub
```

```
Private Sub mnuHelpAbout_Click()
   frmAbout.Show vbModal, Me
End Sub
```

```
Private Sub mnuViewCalendar_Click()
   frmDosingCalendar.Show
   'if the form is minimized then set it back to normal
   If frmDosingCalendar.WindowState = vbMinimized Then frmDosingCalendar.WindowState = vbNormal
   frmDosingCalendar.ZOrder
End Sub
```

```
Private Sub mnuViewExplorer_Click()
   mnuViewExplorer.Checked = Not mnuViewExplorer.Checked      'toggle the state of the check box
   SSListBar1.Visible = mnuViewExplorer.Checked
End Sub
```

```
Private Sub mnuViewOptions_Click()
   frmOptions.Show vbModal, Me
End Sub
```

```
Private Sub mnuViewPatientDosingReport_Click()
    frmPatientDosingReport.Show
    'if the form is minimized then set it back to normal
    If frmPatientDosingReport.WindowState = vbMinimized Then frmPatientDosingReport.WindowState = vbNormal
    frmPatientDosingReport.ZOrder
End Sub
```

```
Private Sub mnuViewPatientSummary_Click()
    frmPatientSummary.Show
    'if the form is minimized then set it back to normal
    If frmPatientSummary.WindowState = vbMinimized Then frmPatientSummary.WindowState = vbNormal
    frmPatientSummary.ZOrder
End Sub
```

```
Private Sub mnuViewStatusBar_Click()
    If mnuViewStatusBar.Checked Then
        sbStatusBar.Visible = False
        mnuViewStatusBar.Checked = False
    Else
        sbStatusBar.Visible = True
        mnuViewStatusBar.Checked = True
    End If
End Sub
```

```
Private Sub mnuViewToolbar_Click()
    If mnuViewToolbar.Checked Then
        tbToolBar.Visible = False
        mnuViewToolbar.Checked = False
    Else
        tbToolBar.Visible = True
        mnuViewToolbar.Checked = True
    End If
End Sub
```

```
Private Sub SSListBar1_ListItemClick(ByVal ItemClicked As Listbar.SSListItem)

    Select Case SSListBar1.CurrentGroupKey
    Case "Patient Data"     'patient data
        Select Case ItemClicked.Key
            Case "Event Calendar"           'calendar
            mnuViewCalendar_Click

            Case "Summary"                  'summary
            mnuViewPatientSummary_Click

            Case "Dosing Information"       'grid
            mnuViewPatientDosingReport_Click

            Case "All Patients"             'all patients
            mnuViewAllPatients_Click

        End Select


    Case "Device"       'device data
        Select Case ItemClicked.Key
```

frmMain.frm - SSListBar1_ListItemClick


```
        Case "Retrieve Data"          'read device data
          mnuReadDeviceData_Click

        Case "Program Device"         'send to DosPro Device
          mnuSendDeviceData_Click
    End Select
  End Select
End Sub
```

Private Sub tbToolBar_ButtonClick(ByVal Button As ComctlLib.Button)

```
Select Case Button.Key

  Case "Open"
    mnuFileOpen_Click

  Case "Save"
    mnuFileSave_Click

  Case "Print"
    mnuFilePrint_Click

  Case "Cut"
    'mnuEditCut_Click

  Case "Copy"
    'mnuEditCopy_Click
'     Clipboard.Clear
'     If TypeOf ActiveForm.ActiveControl Is TextBox Then
'       Select Case Index
'         Case 0  ' Cut.
'           Copy selected text to Clipboard.
```

```
'           Clipboard.SetText ActiveForm.ActiveControl.SelText
'           Delete selected text.
'           ActiveForm.ActiveControl.SelText = ""
'         Case 1  ' Copy.
'           Copy selected text to Clipboard.
'
'         Clipboard.SetText ActiveForm.ActiveControl.SelText
'         Case 2  ' Paste.
'           Put Clipboard text in text box.
'           ActiveForm.ActiveControl.SelText = Clipboard.GetText()
'         Case 3  ' Delete.
'           Delete selected text.
'           ActiveForm.ActiveControl.SelText = ""
```